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AIR-TO-GROUND GUNNERY: A-77, A-78, A-79, AND B-7 FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

DEPARTMENT OF THE AIR FORCE

Air Armament Center

Eglin Air Force Base, Florida

July 2004

Report Documentation Page			*Form Approved OMB No. 0704-0188*
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.			
1. REPORT DATE **JUL 2004**	2. REPORT TYPE		3. DATES COVERED **00-00-2004 to 00-00-2004**
4. TITLE AND SUBTITLE **Air-to-Ground Gunnery: A-77, A-78, A-79, and B-7 Final Programmatic Environmental Assessment**			5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)			5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Armament Center (ACC) 46 Test Wing/XPE,Range Environmental Planning Office,Eglin AFB,FL,32542**			8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR’S ACRONYM(S) 11. SPONSOR/MONITOR’S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited**			
13. SUPPLEMENTARY NOTES			
14. ABSTRACT			
15. SUBJECT TERMS			

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**273**	

Finding of No Significant Impact
Air-To-Ground Gunnery
Programmatic Environmental Assessment
for the
Air Armament Center, Eglin AFB FL
RCS 03-1235

The Air Armament Center proposes to authorize an increased level of military test and training activities in the Air-To-Ground Gunnery (ATG) mission on several test areas at Eglin Air Force Base, Florida. The Eglin test areas under consideration include A-77, A-78, A-79 and B-7, all located on the west side of the Eglin reservation. During the baseline period, fiscal years 1998 to 2001, these areas supported nearly 10,000 missions.

The proposed action will allow the Commander, 46th Test Wing, to authorize levels of activity for the ATG mission based upon estimates of increased use. Four alternatives were considered:

- Alternative 1 (No Action): Maintain the baseline level of mission activity (FY98-01 Range Utilization Report).

- Alternative 2: Authorize activity at the baseline level of activity (same as Alternative 1), plus insert Range Sustainability Best Management Practices (BMPs).

- Alternative 3: Authorize the activities contained in Alternative 2 and a 50 percent increase in mission intensity.

- Alternative 4: Authorize the activities contained in Alternative 2 and a 100 percent increase in mission intensity.

SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

The Programmatic Environmental Assessment (PEA) focused on the subject areas with the greatest likelihood for potential environmental impacts. In each case, the assessment found that the preferred alternative would not result in significant impacts. Some of the areas studied include:

- Noise from munitions operations.

- Hazardous materials from the residue of military munitions.

BASIS FOR FINDING OF NO SIGNIFICANT IMPACT

The Air-To-Ground Gunnery PEA was prepared in compliance with the requirements of the National Environmental Policy Act, the Council on Environmental Quality Regulations and 32 CFR 989 (Air Force Instruction 32-7061, "The Environmental Impact Analysis Process"). Selection of Alternative 5, the preferred alternative, for the Air-To-Ground Gunnery proposal would not have a significant impact upon human health or the environment.

Therefore, an environmental impact statement is not warranted and will not be prepared.

Edmond B Keith

EDMOND B. KEITH, Col, USAF
Commander

11 Sep 04

Date

RCS 03-1235

EGLIN AIR FORCE BASE
Florida

AIR-TO-GROUND GUNNERY: A-77, A-78, A-79, AND B-7

FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

July 2004

AIR-TO-GROUND GUNNERY: A-77, A-78, A-79, B-7

FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Submitted to:

AAC
46 TW/XPE
Range Environmental Planning Office
Eglin Air Force Base, FL 32542-6808

RCS 03-1235

July 2004

PRINTED ON RECYCLED PAPER

Deliverable 7
Subtask 1-5

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

>	Greater Than
<	Less Than
15 SOS	15th Special Operations Squadron
16 SOS	16th Special Operations Squadron
16 SOW	16th Special Operations Wing
20 SOS	20th Special Operations Squadron
23 STS	720 STGP includes the 23rd Special Tactics Squadron
38 RQS	38th Rescue Squadron
4 SOS	4th Special Operations Squadron
6 SOS	6th Special Operations Squadron
720 STGP	720th Special Tactics Group
8 SOS	8th Special Operations Squadron
9 SOS	9th Special Operations Squadron
AAC	Air Armament Center
AAC/EMH	Historic Preservation Cultural Resources Division of Environmental Management Directorate
AAC/EMR	Environmental Management Directorate, Restoration Division
AAC/EMSN	Natural Resources Branch, Stewardship Division of Environmental Management Directorate
AAC/SE	Safety Office
AAV	Amphibious Assault Vehicle
ACC	Air Combat Command
AFB	Air Force Base
AFDTC	Air Force Development Test Center
AFI	Air Force Instruction
AFID	Aviation Foreign Internal Defense
AFOSH	Air Force Occupational and Environmental Safety, Fire Prevention, and Health
AFPD	Air Force Policy Directive
AGL	Above Ground Level
AHPA	Archaeological and Historic Preservation Act
AHRM	Archaeological and Historic Resources Management
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
Al	Aluminum
$Al(OH)_3$	Aluminum Hydroxide
Al^{+3}	Trivalent Aluminum
Al_2O_3	Aluminum Oxide
ALMs	Maximum A-weighted Noise Levels
Alt.	Alternate
AOC	Area of Concern
ARG/MEU	Amphibious Ready Group/Marine Expeditionary Unit
ARPA	Archaeological Resources Protection Act
ATGG	Air-to-Ground Gunnery
BCF	Bioconcentration Factor
BDU	Practice Dumb Bomb Unit
BMP(s)	Best Management Practice(s)
BOD	Biochemical Oxygen Demand
°C	Degrees Celsius
CAA	Clean Air Act
cal	Caliber
CATEX	Categorically Excluded (Categorical Exclusion)
CCCL	Coastal Construction Control Line
CEIS	Center for Environmental Information and Statistics
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS CONT'D

cm	Centimeter
CO	Carbon Monoxide
COC	Community of Comparison
COMTUEX	Navy Composite Training Unit Exercise
COPCs	Contaminants of Potential Concern
CRMP	Cultural Resources Management Plans
CT	Eglin/FNAI Conservation Target
CWA	Clean Water Act
CY	Calendar Year
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	A-Weighted Sound Pressure Level in Decibels
dBC	C-Weighted Sound Pressure Level in Decibels
DBH	Diameter at Breast Height
dBP	Unweighted Peak Sound Pressure Level
DO	Dissolved Oxygen
DoD	Department of Defense
DPI	Direct Physical Impact(s)
DU	Depleted Uranium
E	Endangered
EA	Environmental Assessment
EGTTR	Eglin Gulf Test and Training Range
EIAP	Environmental Impact Analysis Process
EJ	Environmental Justice
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
EPNL	Effective Perceived Noise Levels
ESA	Endangered Species Act
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FAMU	Florida A&M University
FAR	Federal Aviation Regulation
FCMP	Florida Coastal Management Program
FDEP	Florida Department of Environmental Protection
FE	Federally Endangered
FEMA	Federal Emergency Management Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act Insecticide and Environmental Pesticide Control
FLPMA	Federal Land Policy and Management Act
FNAI	Florida Natural Areas Inventory
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	Feet
FT	Federally Threatened
FT(S/A)	Federally Threatened Due to Similarity of Appearance to Another Species
FWC	Florida Fish and Wildlife Conservation Commission
FWPCA	Federal Water Pollution Prevention and Control Act
FY	Fiscal Year
GBU	Guided Bomb Unit
GIS	Geographic Information System
GPS	Global Positioning System
HAVE ACE	A ground support training activity that conducts specialized training for Special Forces
HE	High Explosive
HE/TP	High Explosive/Target Practice

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS CONT'D

HEI	High Explosive Incendiary
HMMWV	High Mobility Multi-Purpose Wheeled Vehicle
HMX	High Melting Explosive (1,3,5,7-tetranitro-1,3,5,7-tetrazacyclooctane)
HPA	High Probability Area
HW	Hazardous Waste
HWY	Highway
IDS	Infrared Detecting System
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
JTFEX	Joint Task Force Exercise
kg/d	Kilograms per Day
km	Kilometer
LAV	Land Assault Vehicle
lb	Pound
lb/1000 lbs	Pounds per 1,000 Pounds
lb/hr	Pounds per Hour
lb/lb	Pounds per Pound
L_{Cdn}	C-weighted Day-Night Sound Levels
L_{dn}	Day-Night Average Sound Levels
L_{eq}	Equivalent Sound Level
$L_{eq(24)}$	24-hour equivalent sound level
LGTR	Laser Guided Training Round
LOAEL	Lowest Observed/Observable Adverse Effects Level
LRMP	Legacy Resource Management Program
m	Meters
m^2	Square Meters
MAG 42	Marine Aircraft Group
MBTA	Migratory Bird Treaty Act
MCL	Maximum Concentration Level
MEA	Management Emphasis Area
µg/L	Micrograms per Liter
$\mu g/m^3$	Micrograms per Cubic Meter
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams per Kilogram per Day
mg/L	Milligrams per Liter
mg/m^3	Milligrams per Cubic Meter
MgO	Magnesium Oxide
Mho	A unit of electrical conductance in the International System, equal to one ampere per volt
mi^2	Square Miles
Mk	Mark
mL	Milliliter
mm	Millimeters
MSDS	Material Safety Data Sheets
NAAQS	National Ambient Air Quality Standard
NAPS	Noise Assessment and Prediction Model
NAWQC	National Ambient Water Quality Criteria
NCA	Noise Control Act
ND	No data
NEPA	National Environmental Policy Act
NEW	Net Explosive Weight
NEWT	Navy Expeditionary Warfare Training
NFA	No Further Action
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS CONT'D

NOAEL	No Observed/Observable Adverse Effect Level
NOSIH-AA-2	Rocket Motor
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NTU	Nephelometric Turbidity Unit
O_3	Ozone
OFWs	Outstanding Florida Waters
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Act
Pb	Lead
PBA	Programmatic Biological Assessment
PEA	Programmatic Environmental Assessment
pH	Measurement of the basic or acid condition of a liquid
PM_{10}	Particulate Matter with an Aerodynamic Diameter of Less than or Equal to 10 microns
$PM_{2.5}$	Particulate Matter with an Aerodynamic Diameter of Less than or Equal to 2.5 microns
POI	Point of Interest
PPA	Pollution Prevention Act
ppm	Parts Per Million
PSD	Prevention of Significant Deterioration
RAIS	Risk Analysis Information System
RCRA	Resource Conservation and Recovery Act
RCW	Red-cockaded Woodpecker
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RIC	Radioisotope Committee
ROCC	Range Operations Control Center
ROI	Region of Influence
RQS	Rescue Squadron
RSO	Radiological Safety Officer
SACEX	Supporting Arms Coordination Exercise
SACON	Shock-Absorbing Concrete
SAIC	Science Applications International Corporation
SDWA	Safe Drinking Water Act
SE	State Endangered
SEALs	Sea-Air-Land Teams
SEL	Sound Exposure Levels
SERDP	Strategic Environmental Research and Development Program
SESOIL	Seasonal Soil Compartment Model
SFAR	Supplemental Federal Aviation Regulation
SHPO	State Historical Preservation Officer
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
SOG	Support Operations Group
SOS	Special Operations Squadron
SOW	Special Operations Wing
SPL	Sound Pressure levels
SSC	State Species of Special Concern
SSCC	State Species of Special Concern Candidate
SSLs	Soil Screening Levels
ST	State Threatened
STGP	Special Tactics Group
STS	Special Tactics Squadron
SW	Solid Waste
T	Threatened

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS CONT'D

T&E	Threatened and Endangered
TA	Test Area
TECG/OPFOR	Tactical Exercise Control Group/Opposing Force
THI	Temperature-Humidity Index
TNT	2,4,6-Trinitrotoluene
TOW	Tube Launched, Optically Tracked, Wire Guided
TOXNET	A Cluster of Databases on Toxicology, Hazardous Chemicals, and Related Areas
TP	Target Practice
TRV	Toxicity Reference Value
TT	Test Target
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAF	U.S. Air Force
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UV	Ultraviolet
UW	Unconventional Warfare
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WHO	World Health Organization
WP	White Phosphorus (Willy Pete)

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1. PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The Eglin Military Complex is a Department of Defense (DoD) Major Range Test Facility Base that exists to support the DoD mission (Figure 1-1). Its primary function is to support research, development, test, and evaluation of conventional weapons and electronic systems. Its secondary function is to support training of operational units. The range is composed of four components.

1) Test Areas/Sites (Figure 1-2)
2) Interstitial Areas (areas beyond and between the test areas)
3) Water Ranges (the Eglin Gulf Test and Training Range (EGTTR) and estuarine and riverine areas)
4) Airspace (over land and water)

The Air Force Air Armament Center (AAC) has responsibility for the Eglin Military Complex and for all its users, which include the DoD, other government agencies, foreign countries, and private companies. For range operations, AAC provides environmental analyses and necessary National Environmental Policy Act (NEPA) documentation to ensure compliance with Air Force policy and applicable federal, state, and local environmental laws and regulations.

AAC includes two wings and four directorates that collectively operate, manage, and support all activities on the Eglin Military Complex. AAC accomplishes its range operations through the 46th Test Wing with support from the 96th Air Base Wing. The 46th Test Wing Commander is responsible for day-to-day scheduling, executing activities, and maintaining the Eglin Military Complex. The continued DoD utilization of the Eglin Military Complex requires flexible and unencumbered access to land ranges and airspace, which support all of Eglin's operations. Eglin controls airspace overlying 127,868 square miles (mi^2), of which 2.5 percent (3,226 mi^2) is over land and 97.5 percent (124,642 mi^2) is over water.

The 46th Test Wing is analyzing the cumulative environmental impacts of all current and anticipated future operations conducted within the test areas A-77, A-78, A-79, and B-7 on Eglin Air Force Base (AFB) (Figure 1-2) in this Programmatic Environmental Assessment. The environmental analysis of the Air-to-Ground Gunnery (ATGG) mission activities is part of the development of a range *Living Environmental Baseline* to support the diverse array of warfighters that use the Eglin Military Complex for research, development, testing, evaluation, and training.

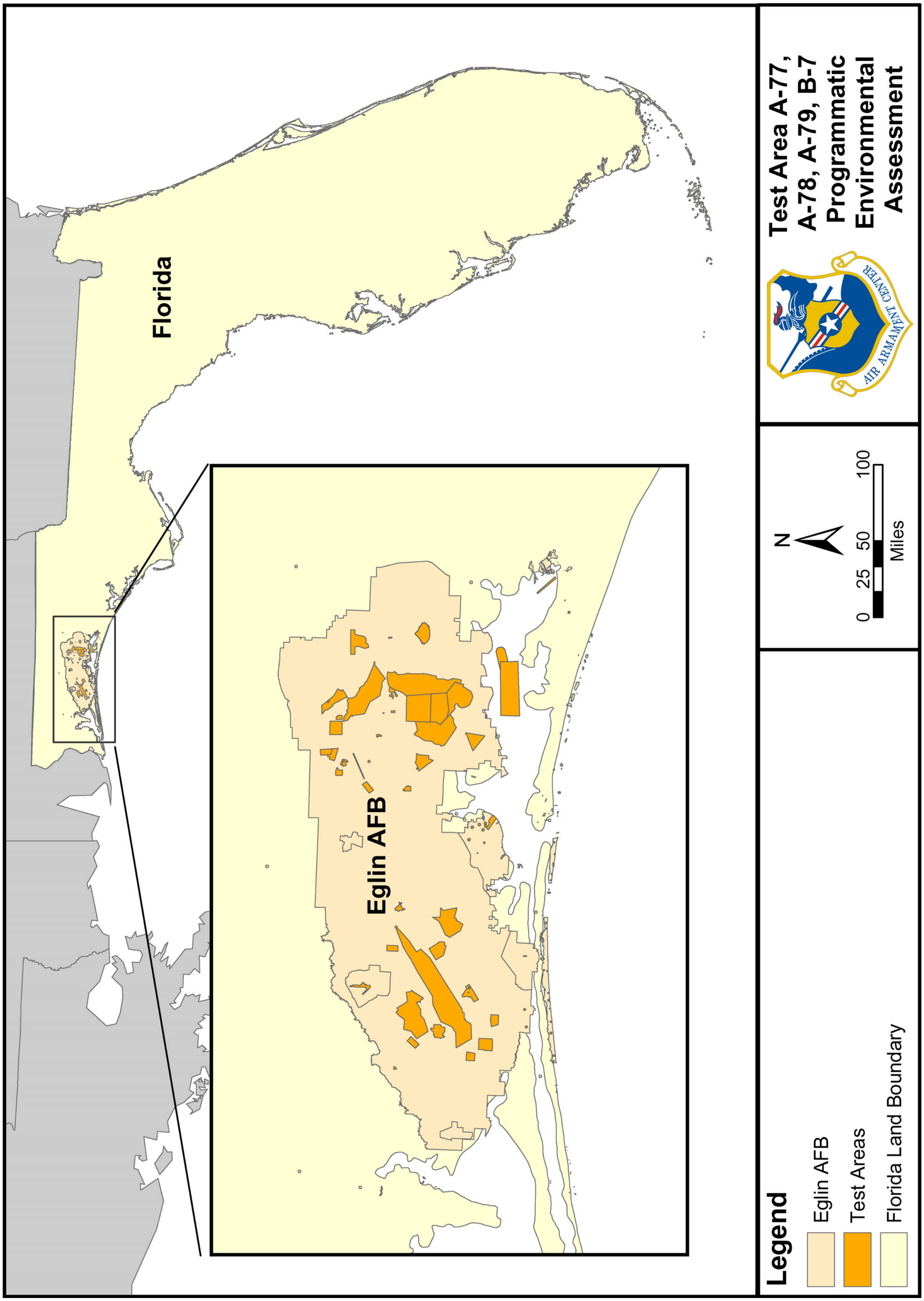

Figure 1-1. The Eglin Military Complex

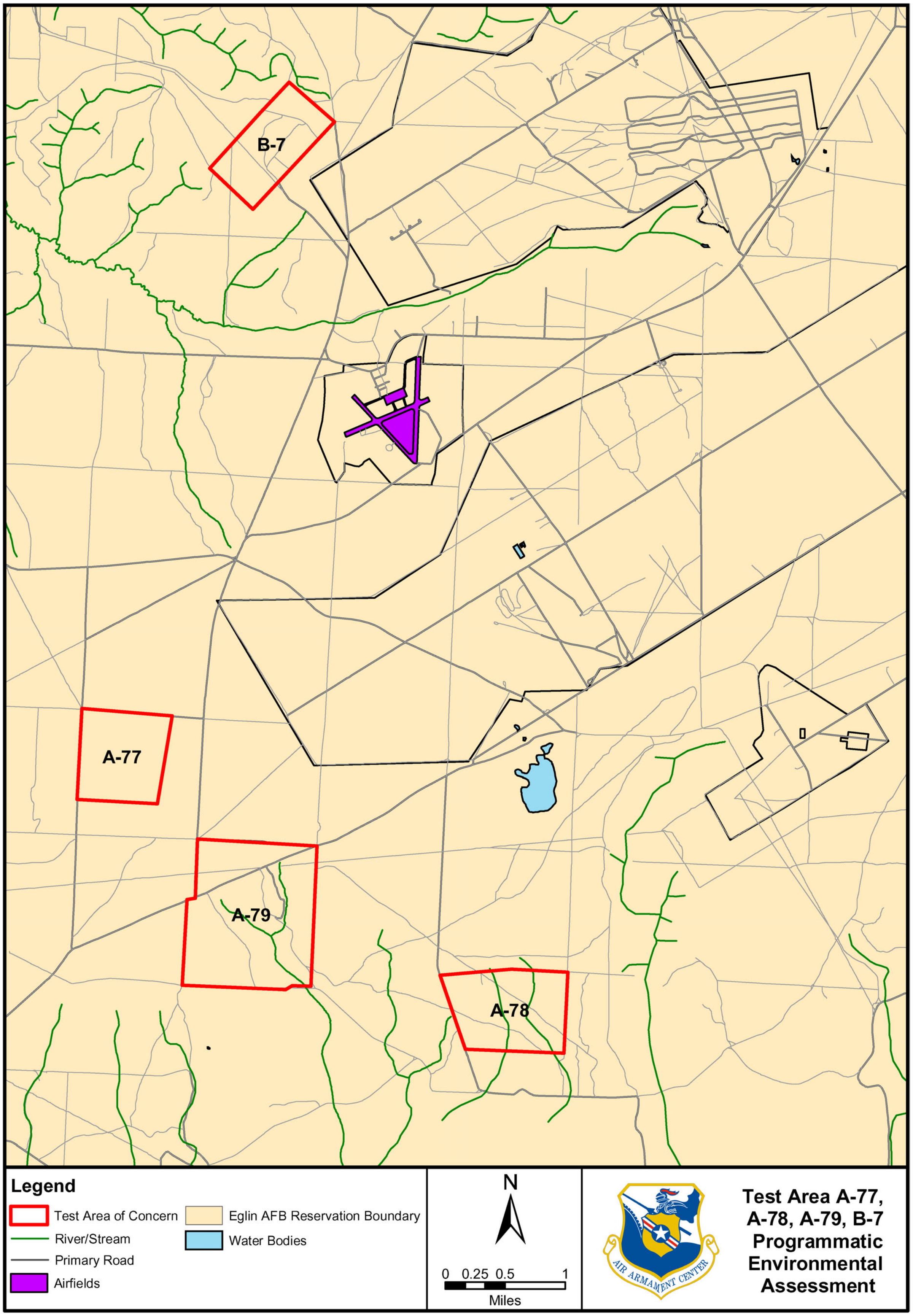

Figure 1-2. Test Areas A-77, A-78, A-79, and B-7

1.2 PROPOSED ACTION

The **Proposed Action** is for the 46th Test Wing Commander to establish an authorized level of activity within Test Areas A-77, A-78, A-79, and B-7 based on an anticipated maximum usage, plus the implementation of best management practices (BMPs), with minimal environmental impacts. The purpose and need for this Proposed Action is three-fold. **First**, quickly and efficiently process new programs requesting use of the land test areas during routine and crisis situations. The need associated with this purpose is to provide military users a quick response to priority needs during war or other significant military involvement, as well as to improve the current approval process for routine uses. **Second**, to update the NEPA analysis by reevaluating the mission activities and by performing a cumulative environmental analysis of all mission activities. The multifaceted need associated with this purpose is described below. **Third**, sustainable use of the ranges depends on an improved understanding and compliance with current environmental laws, including the conduct of analysis where it may be lacking. The need is to provide the armed services with suitable arenas in which to test and train in order to maintain proficiency and readiness for situations in which the military is needed.

Eglin has performed environmental analyses on its mission activities on a case-by-case (i.e., each individual mission) basis since NEPA was enacted in 1970. Many of Eglin's mission activities have not ceased since the original environmental analyses were done to initiate the mission; thus no new environmental reviews have been required or performed. Currently, when approval for a new mission is requested, it may be categorically excluded from additional environmental analysis if it is similar in action to a mission that has been previously assessed and the assessment resulted in a finding of no significant environmental impact. The categorical exclusion (CATEX) designation is in accordance with NEPA and Air Force regulations (Council on Environmental Quality (CEQ) and Air Force Instruction (AFI) 32-7061).

Since some of these ongoing mission activities were originally assessed, and also since similar mission activities were assessed and CATEXed, changes have occurred at Eglin that could affect environmental analysis. These changes, outlined below, create a need to reevaluate the NEPA analysis individually and cumulatively.

- Additional species have been given federal and state protection status.
- Species have been discovered that were not previously known to exist at Eglin.
- Additional cultural resources have been discovered and documented.
- The population of communities along Eglin's borders has increased.
- Air Force regulations have changed.
- Military missions and weapons systems have evolved.

Additionally, with work performed during the 1990s by Eglin in conjunction with The Nature Conservancy, the Eglin ecosystems are better understood now than ever before.

Finally, while each mission has been analyzed individually, a cumulative analysis of potential environmental impacts from all mission activities has not been performed. The programmatic

analysis performed in this report allows for a cumulative look at the impact on Eglin receptors from all mission activities. By implementing an authorized level of activity, sustainable range management will be streamlined and cumulative environmental impacts will be more fully considered.

1.3 SCOPE OF THE PROPOSED ACTION

The scope of the Proposed Action includes military mission activities occurring at Test Areas (TAs) A-77, A-78, A-79, and B-7 from a baseline period of 1998 to 2001. The test areas are primarily used for air-to-ground weapons testing and training. A-79 has also been used for and has the capabilities for air-to-water testing. TAs A-77, A-78, and A-79 are located in the western/southwestern portion of Eglin Military Complex. TA B-7 is located in the northwestern portion of the Eglin Military Complex (Figure 1-2).

1.4 DECISION DESCRIPTION

The 46th Test Wing wishes to authorize a level of activity for the land test areas, replacing the current approval process, which evaluates each program individually. A decision is to be made on the level of activity to be authorized. Currently, any new program requiring testing or training activities on the Eglin Range must anticipate at least a 60-day planning cycle. This period is required to complete the Test Directive, which includes the Method-of-Test, safety analysis, and the environmental impact analysis. If the action does not qualify for a categorical exclusion, or if further environmental analysis is required, this process can be adjusted. **Authorizing a level of activity and analyzing the effects of this level of activity may categorically exclude future similar actions from further environmental analysis.** This will save both time and money in the review of proposed actions and will enable users to access the range more quickly and efficiently.

Procedures are in- place, which, in time of crisis, allow the AAC Commander to authorize an accelerated process. This process reduces planning time from 60 days to 3 three days. These crisis procedures operate at the expense of all other work and cause major disruptions in the process. Authorization should streamline the environmental process, enhancing Eglin's ability to quickly respond to high priority or crisis requirements.

1.5 ISSUES

The potential environmental consequences of TAs A-77, A-78, A-79, and B-7 mission activities were examined and found to be characterized by the following broad issue categories: Noise, Restricted Access/Safety, Debris, Habitat Alteration, Direct Physical Impacts, Chemical Materials, and Air Quality.

Noise

Noise is defined as the unwanted sound produced by mission testing or training. Noise may directly inconvenience and/or stress humans and some wildlife species and may cause hearing loss or damage. Scientific data correlating the effects of noise on humans is well documented; however, information regarding the effects of noise events on wildlife species is limited. The impacts of noise to the public and on wildlife, particularly threatened and endangered species, are a primary concern.

Testing and/or training activities involving munitions detonations, and the use of gunnery from low-level aircraft may produce noise. The environmental consequences analysis attempts to evaluate the potential impacts of mission noise events on the public and sensitive wildlife species.

Restricted Access/Safety

Restricted access is typically the result of safety considerations. Safety involves hazards to military personnel and the public resulting from mission activities. Restricted access is a decrease in the availability of Eglin resources to the public resulting from the temporary closure of test areas, interstitial/recreational areas, or public roads because of mission activities. Receptors potentially impacted include the military and the public desiring to use these areas. Guidance for restricted access and safety is utilized to coordinate public and military use of airspace, water space (e.g., the Gulf of Mexico), and land areas within the Eglin region of influence (ROI). Mission activities that are of potential consequence to restricted access and safety within TAs A-77, A-78, A-79, and B-7 involve the use of low-level aircraft, live munition detonations, ground-fired small arms, and the need for area closures to nonparticipating personnel due to large-scale training exercises.

Debris

Debris is a by-product of testing or training and may include items such as spent casings, bomb fragments, and target or structure fragments. The potential impacts are primarily related to physical disturbances to people, wildlife, or other users of the range, rather than the chemical alterations that could result from the residual materials. Examples of debris deposited from TA A-77, A-78, A-79, and B-7 activities may potentially include: shell casings, canisters from signal smokes, flares, chutes from flares, unexploded munitions or other ordnance and historical debris from targets and test structures.

Habitat Alteration

Habitat alterations are described as the physical damage or changes to the habitats of the terrestrial or aquatic environment. Examples of habitat alterations include potential damage to sensitive habitats on and around TAs A-77, A-78, A-79, and B-7 from wildfire related to live fire and pyrotechnic use or ground movement that may occur.

Direct Physical Impacts

Direct physical impact is the physical harm that can occur to an organism (plant or animal) or cultural resource as a result of mission or land use activities. Examples include vehicle-animal road collisions, crushing an organism by vehicle or foot traffic, and ordnance shrapnel or debris striking an organism. Direct physical impact is also a threat to prehistoric and historic cultural features; significant features, structures, artifacts, and site integrity may be damaged or lost due to physical disruptions. The mission activities of potential consequence to direct physical impacts within TAs A-77, A-78, A-79, and B-7 include testing or training that involves ordnance and foot/vehicle traffic.

Chemical Materials

Chemical materials encompass liquid, solid, or gaseous substances that are released to the environment as a result of mission activities. The environmental analysis of chemical materials describes the amounts, extent, and estimated concentration of chemical materials produced by mission activities with regard to potential impacts to vegetation, wildlife, water, and sediment quality. Examples of chemical materials on TAs A-77, A-78, A-79, and B-7 include residue from ordnance and propellants.

Air Quality

Air resources pertain to the potential for actions to impact local air quality, based on air quality criteria as established by the U.S. Environmental Protection Agency (USEPA) and adopted by the Florida Department of Environmental Protection (FDEP), potentially resulting in negative health effects to both humans and wildlife. Air emissions from a variety of sources have the potential to impact air quality; each source is assessed independently, but the sources are also analyzed cumulatively to assess overall impacts to air quality resulting from all training activities.

1.6 FEDERAL PERMITS, LICENSES, ENTITLEMENTS, AND OTHER REGULATORY REQUIREMENTS

Consultation with the U.S. Fish and Wildlife Service (USFWS) to determine the extent of potential impacts to sensitive species and with the FDEP for violations of federal and state water quality standards by the proposed mission alternatives may include:

- Potential impacts due to red-cockaded woodpecker (RCW) cavity tree mortality from noise and mission-related wildfires.
- Potential impacts to water quality associated with nonpoint source pollution from TA runoff to surface waters or percolation to ground waters from munitions residue.
- Potential impacts to water quality from the impoundment (infrequent) of Johnson Pond (TA A-79).

1.7 ENVIRONMENTAL JUSTICE AND CHILD SAFETY

On 11 February 1994, Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued with the directive that during the NEPA process, federal agencies adopt strategies to address the environmental concerns of minority and low-income communities that may be impacted by the implementation of federal missions. The intent of the Executive Order is to ensure that no individual or community, regardless of race, ethnicity, or economic status, should shoulder a disproportionate share of adverse environmental impacts to human health or environmental condition resulting from the execution of federal missions. The purpose of environmental justice is to identify disproportionately high and adverse socioeconomic and/or environmental impacts and identify appropriate alternatives.

Executive Order 13045 mandates that all federal agencies assign a high priority to addressing health and safety risks to children, coordinating research priorities on children's health, and ensuring that their standards take into account special risks to children.

There are no low-income, minority individuals, communities, or children (at special risk) that are anticipated to bear a disproportionate share of adverse socioeconomic or environmental impacts by the execution of military missions on TAs A-77, A-78, A-79, and B-7. The Environmental Justice issue that could potentially be associated with the decision regarding the Preferred Alternative for the test areas is noise from increased operations. An environmental justice analysis is included in the environmental consequences section of this document.

The access of the public to TAs A-77, A-78, A-79, and B-7 during mission activities is restricted regardless of socioeconomic status for safety and security reasons and does not disproportionately impact individuals or communities of concern. As a result, an additional analysis of environmental justice will not be included in subsequent NEPA documentation.

The Executive Order also requires the application of equal consideration for Native American Programs. This may include the protection of Native American tribal lands and resources such as treaty-protected resources, cultural resources, and/or sacred sites. This issue, along with the associated public participation mechanisms, is fully addressed via Eglin's compliance with the Native American Graves and Repatriation Act of 1990 and the American Indian Religious Freedom Act.

2. ALTERNATIVES

2.1 INTRODUCTION

This section introduces the alternatives that will be evaluated for potential environmental impacts in this Programmatic Environmental Assessment for TAs A-77, A-78, A-79, and B-7. Alternatives identify an action or a series of actions that achieve the desired results. For the purposes of this document, the alternatives for these test areas are formulated with the following attributes.

- Support the current level of mission activities.
- Accommodate increases in military missions especially during surge and crisis needs in an environmentally responsible manner.
- Identify Best Management Practices (BMPs) for minimizing the impact potentials of military land use on ecosystem quality.

The proposed alternatives, which are analyzed in this document, are:

- Alternative 1 (No Action Alternative): Continued utilization of the TAs A-77, A-78, A-79, and B-7, involving current mission activities as described in Chapter 1 of this document, evaluating each mission as needed.
- Alternative 2: Authorize current level of activity as described in Chapter 1 plus Range Sustainability Best Management Practices (BMPs).
- Alternative 3: Alternative 2 plus a 50 percent increase in all missions.
- Alternative 4: Alternative 2 plus a 100 percent increase in all missions.

The baseline level of activity is established to represent the variety of users, mission activities, and maximum amount of expended items that comprise missions at these test areas. Three principal sources of information shaped the baseline: personal interviews and meetings with user groups, data on missions and expended items obtained from Range Utilization Reports, and Air Force Environmental Impact Analysis Process (EIAP) documentation (e.g., AF 813s and environmental assessments). Expended items are referred to throughout this report as "expendables" and are broadly defined as anything deposited onto the range during a mission even though later retrieved. Expendables include items such as ammunition rounds, smokes, flares and pyrotechnics, but also include personnel that parachute or drop onto the range and equipment that is dropped from helicopters or aircraft.

2.2 ALTERNATIVES CONSIDERED

A brief description of each alternative is provided below.

2.2.1 Alternative 1 (No Action Alternative): Continued Utilization as Needed

The No Action Alternative is based on the current level of activity for a baseline period between fiscal years (FY) 1998 through FY01. This alternative is then defined as continuing the current practice of analyzing each mission area activity on an individual basis. This process has served Eglin well and has allowed good stewardship of the Eglin resources for many years. ***This alternative does not authorize any level of activity for TAs A-77, A-78, A-79, and B-7***. Therefore, each activity and associated location is identified by the proponent and evaluated by a working group. If further environmental analysis is required, an Environmental Assessment would be prepared. This is a time-intensive process. Crisis or surge activities can be handled reasonably quickly, but at the expense of other programs. The baseline was developed for each TA using expendable data from FY98 through FY01. The maximum annual number of expendables used at each test area over the four-year period is presented as the baseline in Table 2-1. Chaff is expended in the Eglin over air area R-2915A. Quantification of chaff at each specific area is difficult. However, the impacts from chaff use are analyzed in Chapter 4.

Table 2-1. Summary Baseline Expendables Used at Test Areas A-77, A-78, A-79, and B-7

Test Area	Ordnance	Baseline Expendable Use	Baseline Expendable NEW (lb)	Baseline Expendable Bulk Weight (lb)
A-77	Bomb – inert	280	23	7,000
	Flare	144	2	61
	Gun – inert	72,094	0	31,743
	Gun – live	121,859	53,552	339,260
	Missile – live	2	50	244
	Small Arms – inert	158	0	111
	Small Arms – live	1,899,567	0	50,419
	Smoke	400	69	280
	Miscellaneous Expendables	39,767	0	9,138
	Total	**2,134,271**	**53,696**	**438,256**
A-78	Bomb – inert	56	4	5,312
	Flare	103	2	116
	Gun – inert	50,061	0	18,708
	Gun – live	95,089	45,916	280,469
	Missile – live	6	149	732
	Small Arms – live	1,419,190	0	40,355
	Small Arms – inert	280	0	196
	Miscellaneous Expendables	36,606	0	7,950
	Total	**1,601,391**	**46,071**	**353,838**
A-79	Bomb – live	4	768	2,064
	Miscellaneous Expendables	17,767	3,435	4,948
	Total	**17,771**	**4,203**	**7,012**
B-7	Flare	2	0	2
	Gun – inert	32,465	0	13,096
	Gun – live	61,409	35,269	230,174
	Miscellaneous Expendables	24,163	18	1,453
	Total	**118,039**	**35,287**	**244,725**

lb = pound; NEW = Net Explosive Weight

Geographical Description of the Baseline

The Region of Influence (ROI) for this analysis is TAs A-77, A-78, A-79, and B-7, which are used for air-to-ground weapons testing and training. A-79 has also been used for and has the capabilities for air-to-water testing.

Test Area A-77 Air-To-Ground Tactical Training Area

TA A-77 is an unscored tactical air-to-ground target area located approximately 20 miles west of Eglin Main. This target area is 0.75 mi^2 and contains various tactical targets such as vehicle convoys, bivouac areas, and gun emplacement. An observation bunker and two-story close-quarter battle site building (45 by 30-foot concrete) is located in the northwest corner of this test area. It is used for tactical air-to-ground training in gunnery, bombing, and rocketry delivery. Ground forces use this area as a tactical training area and small arms firing range.

Test Area A-78 Air-To-Ground Tactical Training Area

TA A-78 is an unscored tactical air-to-ground target area located approximately 6 miles northwest of Hurlburt Field. The test area is primarily used for tactical air-to-ground training in gunnery, bombing, and rocketry. This target area is approximately 0.75 mi^2 and contains various tactical targets such as vehicle convoys, bivouac areas, missile sites, and gun emplacement. Tactical targets are scattered throughout TA A-78 and are subject to frequent relocation/reconstruction. Ground forces may also use the site for tactical training and a small arms firing range.

Test Area A-79 Side Firing Weapons System Test Area

TA A-79 is an unscored tactical air-to-water target area located approximately 7 miles northwest of Hurlburt Field. The target area is an extension to Johnson Pond, which contains a dam and spillway. The area is used for explosives training and acoustical testing.

Test Area B-7 Side Firing Weapons Tactical Training Range

TA B-7 is a sparsely wooded area approximately 1 mile by 0.5 mile wide about 20 miles to the northwest of Eglin Main. The test area is used for side firing weapon systems tactical air-to-ground training. One 150-foot resolution target consisting of 6 inches of sandy clay covered with semisolid asphalt and six wood bunkers covered with sandy clay are located within the test area.

Military Baseline Activities

The purpose of military testing and training missions is to verify, validate, or demonstrate operational capabilities of new or upgraded hardware, software, aircraft, or weapons systems, or the effectiveness of tactics. The baseline period missions involved air-to-ground gunnery and occasional testing or technology demonstrations. User groups and associated mission activities are listed in Table 2-2.

Table 2-2. Test Area User Groups and Associated Military Missions

User Group	Training Mission	Test Area
AFSOC – 16th SPECIAL OPERATIONS WING	The 16th Special Operations Wing (SOW) at Hurlburt Field, FL specializes in unconventional warfare. At the direction of the National Command Authorities, the 16 SOW goes into action with specially trained and equipped forces from each service working as a team to support national security objectives. Special operations are often undertaken in enemy-controlled or politically sensitive areas and can cover a myriad of activities. The 16 SOW units are listed below.	A-77, A-78, B-7
16th Special Operations Squadron	The 16th Special Operations Squadron (SOS) "Spectre" flies the AC-130H gunship. Unique equipment on this highly modified C-130 enables the crew to provide surgically accurate firepower in support of both conventional and unconventional forces, day or night. Primary missions include close air support, armed reconnaissance, and interdiction. The weapon system can also perform perimeter defense, forward air control, surveillance, command and control, and overland or water escort. Ordnance expended includes 40 mm HEI, 105 mm High Explosive (HE), 105 mm white phosphorus (WP), 105 mm High Explosive/Target Practice (HE/TP), flares, and chaff. Altitude ranges 3,000 to 15,000 feet with average being 6,000-9,000 feet. Occasional calls for fire, live and dry, with a ground team or other aircraft (MH53s, AC130s, A10s, Apaches). Approximately 500 missions/year; 1-3 missions/day lasting 1.5 hours over the range. All targets on A-77, A-78, and B-7 used; however, those in the center of the ranges are targeted more frequently. No support equipment is used. Safety provided by Eglin Mission, Command Post, and crew.	A-77, A-78, B-7
6th Special Operations Squadron	The 6 SOS is a combat aviation advisory unit reactivated in 1994 to serve the theater combatant commanders' advisory needs during peacetime, crisis, or war. The squadron's wartime mission to advise and train foreign aviation units in airpower employment and sustainment includes three interrelated areas: aviation-foreign internal defense (AFID), unconventional warfare (UW), and coalition support.	A-77, A-78, B-7
8th Special Operations Squadron	The 8 SOS "Blackbirds" flies the MC-130E Combat Talon I. Their mission includes: supporting unconventional warfare missions and special operations forces. The MC-130 aircrews work closely with Army Special Forces and Navy SEALs (sea-air-land teams). In addition, the 8th is able to conduct psychological warfare operations by air-dropping leaflets and can drop large bombs for special attack or psychological effect.	A-77, A-78, B-7
4th Special Operation Squadron	4 SOS "Spooky" operates 13 AC-130U Gunships. The AC-130U is armed with a 25 mm Vulcan cannon (capable of firing 1,800 rounds per minute), a single-barrel, rapid-fire 40 mm Bofors cannon and a 105 mm howitzer. As with all previous gunships, the guns are mounted on the left side of the aircraft. However, an advanced fire control system provides greater flexibility in weapons employment.	A-77, A-78, B-7
9th Special Operations Squadron	The 9 SOS "Night Wings" flies eleven MC-130P Combat Shadows. The squadron's mission is primarily the covert intrusion of sensitive or denied territory for formation low-level air refueling of special operations helicopters. Flying on night vision goggles and operating with lights out, the 9 SOS also uses the MC-130P for covert infiltration/extraction and re-supply of special operations forces by airdrop or ground extraction.	A-77, A-78, B-7

Table 2-2. Test Area User Groups and Associated Military Missions Cont'd

User Group	Training Mission	Test Area
15th Special Operations Squadron	The 15 SOS flies the MC-130H Combat Talon II after being activated 1 Oct 1992. The Combat Talon II is equipped with terrain following/terrain avoidance radar, Infrared Detecting System (IDS), dual inertial navigation systems, Global Positioning System (GPS), electronic countermeasures, a sophisticated communications package, and specialized aerial delivery equipment. With crews trained for demanding night and adverse weather operations, the aircraft is capable of penetrating hostile environments at low altitudes in any type of weather.	A-77, A-78, B-7
20th Special Operations Squadron	The 20 SOS "Green Hornets," flies the MH-53J Pave Low IIIE, the Air Force's most sophisticated helicopter. The primary mission of the 20 SOS is to conduct day or night low-level penetration into hostile enemy territory, to accomplish clandestine infiltration and exfiltration, aerial gunnery support and resupply of special operations forces throughout the world. These operations involve tactical low-level navigation, night vision goggle operations, airland and airdrop techniques, and over-water operations. The unique capabilities of the MH-53J Pave Low allow the 20th to operate from unprepared landing zones in any type of terrain and from otherwise inaccessible areas. The 20 SOS were among the first units to deploy to Operation Desert Shield in August 1990, 20 SOS crewmembers and aircraft led U.S. Army AH-64 Apaches in the air strike, opening the air war in Operation Desert Storm.	A-77, A-78, B-7
823rd RED HORSE	The 823rd Red Horse is assigned to the Air Combat Command (ACC) at Hurlburt Field. Red Horse squadron is a heavy civil engineering construction unit that is self-contained and can rapidly deploy to support U.S. forces around the world. Red Horse airmen have supported operations in Vietnam, Desert Storm, Somalia, and Bosnia. These civil engineering units provide the wartime tasks of force beddown, heavy damage repair, bare-base development, and heavy engineering operations. The 823rd Red Horse conducts demolition training using charges, fuses, detonation cord, and dynamite in a reconditioned clay pit at TA A-79.	A-79
AFSOC HAVE ACE	HAVE ACE is a ground support training activity that conducts specialized training for Special Forces. Training is conducted as a joint operation to prepare personnel from the Army, Navy, and Air Force. The objective of HAVE ACE missions is to infiltrate and exfiltrate without leaving signature or evidence of troop movement. HAVE ACE training missions utilize TAs A-77 and A-78 and within the reservations western interstitial areas. Interstitial activity consists of armed route escorts and combat survival taking place at least once a week for a four-hour period. A small group of 6-10 personnel is utilized and inserted at Auxiliary Field 6. They move south toward TA A-77 and TA A-78 or west along the Yellow River before moving to TA A-77. Military vehicles perform movement on established range roads at night during black out conditions. Bivouac areas and munitions are not used by HAVE ACE in the interstitial areas. The group simulates recoveries once near the test areas.	A-77, A-78
MINOR USER GROUPS		
Army National Guard	Land navigation, boat and water training, parachute drops, practice raids and ambushes. Activities take place on adjacent test areas (primarily B-75); however, range fan does overlay onto B-7.	Range fan B-7

Table 2-2. Test Area User Groups and Associated Military Missions Cont'd

User Group	Training Mission	Test Area
U.S. Navy	Testing of the DSU-33A/B proximity sensor on air dropped Mk-82 bombs, dropped on temporary floating targets. Live fire training as well as land navigation is conducted by Navy Littoral Warfare Unit on and/or around TAs A-77 and A-78. As pre-deployment training, gunships fire 7.62 mm and .50 cal weapons, and F14 and F18 aircraft will fire 20 mm at targets on A-77.	A-79 ** A-77, A-78
720th Special Tactics Group (STGP)	The 720 STGP has special operations combat controllers, pararescuemen, and combat weathermen who deploy jointly in teams by air, land, and sea into forward, non-permissive environments. The unit's missions include air traffic control to establish air assault landing zones, close air support for strike aircraft, personnel recovery, trauma care for injured personnel and tactical meteorological forecasting for Army Special Operations Command. The 720 STGP includes the 23rd Special Tactics Squadron below. Small arms training, call for fire training, fast rope training, infiltration and exfiltration training conducted at A-77 and A-78.	A-77, A-78, B-7
23rd Special Tactics Squadron	The 23 STS flies MH-53 Pave Lows. The squadron comprises pararescuemen, combat controllers, and various support specialties in one cohesive team. This unit provides a force multiplier capability for unconventional warfare in the worldwide arena. The mission of the 23 STS is to deploy specially organized, trained, and equipped forces to survey and assess assault zones; establish and control landing and drop zones in the most austere and inhospitable regions of the world; set up and operate forward area refueling and rearming point; establish and manage casualty collection, triage and evacuation sites; participate in Air Force Special Operations Command foreign internal defense efforts; and provide special operations terminal attack control capability in hostile environments. Small arms training, call for fire training, fast rope, and infiltration and exfiltration operations are conducted.	A-77, A-78, A-79, B-7
MARINE AIRCRAFT GROUP 42	Activities conducted by the MAG 42 include helicopter ordinance training with the use of guns, rockets, and missiles. Munitions used include 20 mm, 7.62 mm, and .50 cal weapons, 2.75 HE white phosphorus, and inert, and the release of flares, chaff, and smoke.	A-77, A-78
38th Rescue Squadron	The 38 RQS is a combat ready pararescue unit and uses various fixed/rotary wing insertion and extraction methods. Personnel training on site includes three to 12 individuals. Small arms live fire and gun ship call for fire training are conducted on test sites on A-77, monthly. Small arms training, call for fire training, fast rope training, and infiltration and exfiltration activities are included in mission exercises.	A-77
41st Rescue Squadron	The 41 RQS from Moody Air Force Base, Georgia, is a rescue squadron utilizing HH-60 helicopters. The unit specializes in combat rescue of downed aircrews, low-level formation, air refueling, and survivor recovery. Ranges are used for training of various weapons systems, with up to four missions per month. Testing of .50 cal and 7.62 mm machine guns on HH-60s are conducted.	A-77, A-78

Sources: http://www.spectrumwd.com/c130/usaf2.htm
http://www.globalsecurity.org/military/agency/usaf/20sos.htm

Potential Future Military Operations

The test areas may be utilized by user groups in the future as presented in Table 2-3.

2.2.2 Alternative 2: Authorize Current Level of Activity Plus Range Sustainability Best Management Practices

Alternative 2 is defined as ***authorizing*** the baseline level of mission activity identified in Alternative 1, Tables 2-1, 2-2, and 2-3 with the addition of proposed range sustainability BMPs designed to protect water quality and sensitive habitats associated with TAs A-77, A-78, A-79, and B-7. *The proposed BMPs are presented as practical options for addressing test area-specific concerns and not a mandate of actions to be performed.* By authorizing this level of activity, similar mission requests may be quickly and efficiently approved.

Table 2-3. Potential Future User Groups of Test Areas A-77, A-78, A-79, and B-7

User Group	Activity	Test Area
Amphibious Ready Group/Marine Expeditionary Unit (ARG/MEU)	Activities are assessed and detailed in the *Amphibious Ready Group/Marine Expeditionary Unit Readiness Training Final Environmental Assessment,* 11 April 2003 and include: reconnaissance insertion, mechanized wet raid, mechanized dry raid, ARG/MEU landing, live fire/or maneuver, withdrawal, TECG/OPFOR.	A-77, A-78, A-79
COMTUEX	**Air-To-Ground Training:** There will be up to 12 single-ship helicopter air-to-ground training sorties, with up to six occurring at night. Flights will conduct 7.62 mm and .50 cal live fire training on approved targets within the Eglin range. **A-77 West and A-78 West:** East and west run in headings Ordnance maximum use per year: LGTR (100 lbs): 128 (inert) Mk-76 (25 lbs): 1,000 (inert) GBU-12/Mk-82: 456 (200 live; 156 inert) GBU-16/Mk-83: 60F-14, F-18 & S-3 delivery profiles: LGTR/GBU delivery level 15,000-24,000 ft at 300-500 knots. Unguided deliveries 15-45 degree dive, 2,000-8,000 ft at 300-550 knots	A-77, A-78
Supporting Arms Coordination Exercise (SACEX)	Artillery, mortars, gunships, and AV-8B. Days 7–9, 72 hours continuous. Ordnance: 60 mm HE, 60 mm ILLUM, 81 mm smoke RP, 81 mm ILLUM, 81 mm HE, 155 mm HE, 155 mm ILLUM, CHG, PROP 155 mm GB, FUZE ET, FUZE, PD, Primer. Activities analyzed in the *Amphibious Ready Group/Marine Expeditionary Unit Readiness Training Final Environmental Assessment,* 11 April 2003.	A-77, A-78
Navy Expeditionary Warfare Training (NEWT)	NEWT includes activities proposed for ARG/MEU Readiness Training and SACEX: Live Fire and Maneuver as described above.	A-77, A-78, A-79

Alternative 2 incorporates range sustainability BMPs in order to provide long-term support for current and future military testing and training. Range sustainability is partly dependent on active stewardship of the air, water, soil, and biological resources that characterized the test areas' ecosystems. Therefore, the primary goal of Alternative 2 is to maximize the long-term range sustainability of TAs A-77, A-78, A-79, and B-7 by fostering the development and maintenance of ecosystems capable of absorbing and recovering from periodic mission impacts and by empowering flexibility in the development of long-term test area mission capabilities.

Based on the analysis of best available scientific data and modeled projections, proactive range sustainability BMPs were developed as practical methods for attaining a relative balance between environmental stewardship and military mission requirements. Sustainability management categories include:

- *Integrated Vegetation Management:* Actions are proposed to control mission-related wildfires through periodic prescribed burns.
- *Munitions Residue Management:* Actions are proposed to minimize munitions residue exposure and to determine the potential for migration in soils to groundwater and surface water. Site sampling plans exist and are standardized by AAC/EMR for each test area to assess and monitor potential site soil and groundwater contamination from mission-related activates.
- *Noise Management*: Action is proposed to reduce both sensitive species' exposure to noise and public noise complaints.

With the overall goal being the maximization of the capabilities of TAs A-77, A-78, A-79, and B-7 to support current and future mission requirements while minimizing adverse impacts to environmental resources, the action-specific objectives of Alternative 2 are to:

- Reduce potential impacts from mission-related wildfires to RCW cavity trees by implementation of prescribed burning on a two-year return interval and limiting hot missions under class D or E levels as determined by the Wildland Fire Management Program at Jackson Guard.
- Reduce surface unexploded ordnance (UXO) and debris contamination by recovering surface munitions debris and utilizing BMPs (e.g., "green" munitions, bullet containment and projectiles management) to reduce potential impacts to soils, groundwater, and surface water. Follow guidance provided in the *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001).
- Assess potential environmental impacts of munitions residue contamination to soils and groundwater by proactively monitoring for the potential migration by implementing site-sampling plans.
- Minimize potential RCW exposure to noise by following guidelines presented in the U.S. Army Management Plan for RCWs and corresponding U.S. Fish and Wildlife Service (USFWS) Biological Opinion.

- Public notification of mission schedules when activity is expected to increase may reduce noise complaints.

2.2.3 Alternative 3: Alternative 2 Plus a 50 Percent Increase in All Mission Activities

Alternative 3 includes the activities proposed in Alternative 2 with a 50 percent increase in mission activities (Table 2-4).

Table 2-4. 50 Percent Increase Expendables Used at Test Areas A-77, A-78, A-79, and B-7

Test Area	Ordnance	Baseline Expendable Use	Baseline Expendable NEW (lb)	Baseline Expendable Bulk Weight (lb)
A-77	Bomb – inert	420	35	10,500
	Flare	216	3	92
	Gun – inert	108,141	0	47,615
	Gun – live	182,789	80,328	508,890
	Missile – live	3	75	366
	Small Arms – inert	237	0	167
	Small Arms – live	2,849,351	0	75,629
	Smoke	600	104	420
	Miscellaneous Expendables	59,651	0	13,707
	Total	**3,201,407**	**80,544**	**657,384**
A-78	Bomb – inert	84	6	7,968
	Flare	155	3	174
	Gun – inert	75,092	0	28,062
	Gun – live	142,634	68,874	420,704
	Missile – live	9	224	1,098
	Small Arms – live	2,128,785	0	60,533
	Small Arms – inert	420	0	294
	Miscellaneous Expendables	54,909	0	11,925
	Total	**2,402,087**	**69,107**	**530,757**
A-79	Bomb – live	6	1,152	3,096
	Miscellaneous Expendables	26,651	5,152	7,422
	Total	**26,657**	**6,305**	**10,518**
B-7	Flare	3	0	3
	Gun – inert	48,698	0	19,644
	Gun – live	92,114	52,904	345,261
	Miscellaneous Expendables	36,245	27	2,180
	Total	**177,059**	**52,931**	**489,450**

2.2.4 Alternative 4: Alternative 2 Plus a 100 Percent Increase in All Mission Activities

Alternative 4 includes the activities proposed in Alternative 2 with a 100 percent increase in mission activities (Table 2-5).

Table 2-5. 100 Percent Increase Expendables Used at Test Areas A-77, A-78, A-79, and B-7

Test Area	Ordnance	Baseline Expendable Use	Baseline Expendable NEW (lb)	Baseline Expendable Bulk Weight (lb)
A-77	Bomb – inert	560	46	14,000
	Flare	288	4	122
	Gun – inert	144,188	0	63,486
	Gun – live	243,718	107,104	678,520
	Missile – live	4	100	488
	Small Arms – inert	316	0	222
	Small Arms – live	3,799,134	0	100,838
	Smoke	800	138	560
	Miscellaneous Expendables	79,534	0	18,276
	Total	**4,268,542**	**107,392**	**876,512**
A-78	Bomb – inert	112	8	10,624
	Flare	206	4	232
	Gun – inert	100,122	0	37,416
	Gun – live	190,178	91,832	560,938
	Missile – live	12	298	1,464
	Small Arms – live	2,838,380	0	80,710
	Small Arms – inert	560	0	392
	Miscellaneous Expendables	73,212	0	15,900
	Total	**3,202,782**	**92,142**	**707,676**
A-79	Bomb – live	8	1,536	4,128
	Miscellaneous Expendables	35,534	6,870	9,896
	Total	**35,542**	**8,406**	**14,024**
B-7	Flare	4	0	4
	Gun – inert	64,930	0	26,192
	Gun – live	122,818	70,538	460,348
	Miscellaneous Expendables	48,326	36	2,906
	Total	**236,078**	**70,574**	**489,450**

2.3 COMPARISON OF ALTERNATIVES

The four alternatives are similar in terms of the type of ordnance expended during missions on the test areas, but differ in the amount of ordnance expended. The baseline level of activity, Alternative 1, and the *authorization* of the baseline level of activity are similar in terms of ordnance expended, but differ because of the inclusion of range sustainability practices. The remaining alternatives are based on increasing the amount of ordnance expended during missions at the test areas.

Table 2-6 presents a comparison of environmental impact analysis results for all alternatives that have the potential to occur over a four-year period based on data provided from FY98 to FY01.

Table 2-6. Comparison of Potential Environmental Impact Analysis Results for All Alternatives

Environmental Issues	Criteria	Test Area	Activity/ Munition	No Action Alternative 1	Alternative 2	Alternative 3	Alternative 4
Noise							
Number of RCW active cavity trees exposed	> 140 dBP	A-77	Maximum (25-lb rocket)	3	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed	> 140 dBP	A-78	Maximum (25-lb rocket)	19	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-79 (Mk-82 at Johnson's Pond)	> 140 dBP	A-79	Maximum (Mk-82)	6	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-79 (C-4 40 lb charge)	> 140 dBP	A-79	Maximum (C-4 40-lb charge)	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on B-7	> 140 dBP	B-7	Maximum (7-lb gunnery)	5	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-77	> 154 dBP	A-77	Maximum (25-lb rocket)	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-78	> 154 dBP	A-78	Maximum (25-lb rocket)	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-79	> 154 dBP	A-79, At Johnson's Pond	Maximum (Mk-82)	4	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on A-79 (C-4 40 lb charge)	> 154 dBP	A-79, In clay pit	Maximum (C-4 40-lb charge)	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of RCW active cavity trees exposed on B-7	> 154 dBP	B-7	Maximum (7-lb gunnery)	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Acres outside Eglin exposed	>115 dBP	ALL	Bombs Guns	1,085	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Number of schools exposed	>115 dBP	ALL	Bombs Guns	2	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

Table 2-6. Comparison of Potential Environmental Impact Analysis Results for All Alternatives Cont'd

Environmental Issues	Criteria	Test Area	Activity/ Munition	No Action Alternative 1	Alternative 2	Alternative 3	Alternative 4
Noise Cont'd							
Number of churches and hospitals exposed	> 115 dBP	ALL	Bombs Guns	0	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Miles of public roads exposed	>115 dBP	ALL	Bombs	Hwy 189: 3 miles	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Restricted Access							
Range Roads Closed (miles)	Roads Closed	ALL	Air to Ground Gunnery (ATGG) Training	234, 676, 678, 682, 700, 710, 729, 735, 737, 747, 751, 753, 759, 785	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
	# Annual Closures	ALL	ATGG Training	365 days	Same as Alt. 1	365 days	365 days
Test Area Use	Test Area Potentially Affected	ALL			Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Debris							
Ordnance	Quantity (Number)	A-77	Ordnance	2,630,460	Same as Alt. 1	3,945,691	5,260,920
		A-78	Ordnance	2,116,416	Same as Alt. 1	3,174,624	4,232,832
		A-79	Ordnance	4	Same as Alt. 1	6	8
		B-7	Ordnance	119,028	Same as Alt. 1	178,542	238,056
Habitat Alteration							
Wildfire	RCW habitat	ALL	Live Ordnance	Fire: Positive impact Mortality of cavity tree by fire: Negative impact	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
	Flatwood salamander habitat	ALL	Live Ordnance	Fire: Positive impact Fire suppression: Negative impact	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
	Bog frog habitat	ALL	Live ordnance	Fire: Positive impact Fire suppression: Negative impact	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1

Table 2-6. Comparison of Potential Environmental Impact Analysis Results for All Alternatives Cont'd

Environmental Issues	Criteria	Test Area	Activity/ Munition	No Action Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Patterson special natural area acreage	ALL	Live ordnance	Fire: Positive impact Fire suppression: Negative impact	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Sedimentation	Surface water quality	ALL	All ATGG Training	No impact anticipated	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Direct Physical Impact							
RCWs	Lethal impact to bird or to tree	ALL	All munitions	No impact anticipated	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
	Lethal impact to bird or to tree	ALL	Ground movement	No impact anticipated	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Cultural Resources	Damage to site and/or artifact	ALL	All munitions	No impact anticipated	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
	Damage to site and/or artifact	ALL	Ground movement	No impact anticipated	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Chemical Materials							
Soil Quality – Modeled Concentrations for Screening							
Chromium	Concentration in soil (mg/kg) for overall test area	A-77	All munitions	0.3	Same as Alt. 1	0.45	0.6
Copper				255	Same as Alt. 1	383	510
Lead				19	Same as Alt. 1	29	38
RDX				0.1	Same as Alt. 1	0.15	0.2
TNT				4.6	Same as Alt. 1	6.9	9.2
Zinc				139	Same as Alt. 1	209	278
Chromium		A-78	All munitions	0.1	Same as Alt. 1	0.2	0.2
Copper				125	Same as Alt. 1	188	250
Lead				12	Same as Alt. 1	18	24
RDX				0.1	Same as Alt. 1	0.16	0.2
TNT				3.3	Same as Alt. 1	5.0	6.6
Zinc				9.5	Same as Alt. 1	14	19
Chromium		A-79	All Munitions	<0.0001	Same as Alt. 1	<0.0001	<0.0001
Copper				<0.0001	Same as Alt. 1	<0.0001	<0.0001
Lead				<0.0001	Same as Alt. 1	<0.0001	<0.0001

Table 2-6. Comparison of Potential Environmental Impact Analysis Results for All Alternatives Cont'd

Environmental Issues	Criteria	Test Area	Activity/ Munition	No Action Alternative 1	Alternative 2	Alternative 3	Alternative 4
RDX				<0.0001	Same as Alt. 1	<0.0001	<0.0001
TNT				7.2	Same as Alt. 1	10.8	14
Zinc				<0.0001	Same as Alt. 1	<0.0001	<0.0001
Chemical Materials Cont'd							
Soil Quality – Modeled Concentrations for Screening Cont'd							
Chromium	Concentration in soil (mg/kg) for overall test area cont'd	B-7	All munitions	0.2	Same as Alt. 1	0.3	0.4
Copper				109	Same as Alt. 1	164	218
Lead				1.3	Same as Alt. 1	2.0	2.6
RDX				0.11	Same as Alt. 1	0.17	0.22
TNT				20	Same as Alt. 1	30	40
Zinc				30	Same as Alt. 1	46	61
Chromium	Concentration in soil (mg/kg) for target sites with 50-foot buffer	A-77	All munitions	2.4	Same as Alt. 1	3.6	4.8
Copper				1,865	Same as Alt. 1	2,798	3,730
Lead				143	Same as Alt. 1	214	285
RDX				1.1	Same as Alt. 1	1.7	2.2
TNT				33	Same as Alt. 1	50	67
Zinc				431	Same as Alt. 1	647	862
Chromium		A-78	All munitions	1.8	Same as Alt. 1	2.7	3.6
Copper				1,528	Same as Alt. 1	2,292	3,056
Lead				153	Same as Alt. 1	229	306
RDX				1.26	Same as Alt. 1	1.89	2.52
TNT				37	Same as Alt. 1	56	75
Zinc				491	Same as Alt. 1	737	982
Chromium		A-79	All munitions	<0.0001	Same as Alt. 1	<0.0001	<0.0001
Copper				<0.0001	Same as Alt. 1	<0.0001	<0.0001
Lead				<0.0001	Same as Alt. 1	<0.0001	<0.0001
RDX				<0.0001	Same as Alt. 1	<0.0001	<0.0001
TNT				40	Same as Alt. 1	60	81
Zinc				<0.0001	Same as Alt. 1	<0.0001	<0.0001
Chromium		B-7	All munitions	2.4	Same as Alt. 1	3.5	4.7
Copper				1,144	Same as Alt. 1	1,716	2,288
Lead				14	Same as Alt. 1	21	29
RDX				1.17	Same as Alt. 1	1.76	2.34
TNT				23	Same as Alt. 1	35	46

Table 2-6. Comparison of Potential Environmental Impact Analysis Results for All Alternatives Cont'd

Environmental Issues	Criteria	Test Area	Activity/ Munition	No Action Alternative 1	Alternative 2	Alternative 3	Alternative 4
Zinc				136	Same as Alt. 1	204	272
Chemical Materials Cont'd							
Groundwater Quality	Contaminant migration	ALL	All munitions	Greatest potential for migration is RDX	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Surface Water Quality	Contaminant migration	ALL	All munitions	No impact anticipated	Same as Alt. 1, potentially reduced	Same as Alt. 1	Same as Alt. 1
Wildlife Impacts	Toxic effects and concentrations of contaminants	ALL	All munitions	No impact anticipated	Same as Alt. 1, potentially reduced	Same as Alt. 1	Same as Alt. 1
Air Quality							
Total suspended particulates	Pollutant emissions (tons)	ALL	All munitions	78	Same as Alt. 1	117	156
Sulfur oxides				1.33		2.0	2.66
Nitrogen oxides				29.7		44.5	59.4
Carbon monoxide				14.2		21.3	28.4
Volatile organic compounds				1.22		1.83	2.44

2.4 PREFERRED ALTERNATIVE

The Preferred Alternative is Alternative 4, which includes the actions described under Alternative 2 with the addition of range sustainability practices. Specifically, Alternative 4 would result in the ability to increase test area mission activity by 100 percent. Operational constraints and management requirements would be implemented to ensure that the designation of these areas and the associated activities that would take place within them to minimize potential impacts to the natural and anthropogenic (human-related) environment. Proposed mission activities would then be easily approved based on prior analysis of designated sites for particular actions. Therefore, the Preferred Alternative, Alternative 4, would provide a relative balance between stewardship of environmental resources and DoD military mission requirements on TAs A-77, A-78, A-79, and B-7.

3. AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The Affected Environment chapter of this report describes the receptors that can be affected by the operations and expended items described in Chapter 2 of this report. The environment includes living and non-living receptors. A receptor can be, for example, a red-cockaded woodpecker (RCW), a stream, or the air. This chapter is organized by physical, biological, and anthropogenic (human-related) environments.

Physical resources include soil, surface water, geology, and air. Descriptions of the local climatology and meteorology are also included because they affect the fate and transport of many of the receptors.

The biological resources portion includes a description of the ecological associations found on Test Areas (TA) A-77, A-78, A-79, and B-7, including the plant and animal species found within the associations. Additional information is presented on threatened and endangered species and sensitive habitats.

The anthropogenic environment includes structures and materials from past and current military and non-military activities. This encompasses cultural resources, Installation Restoration Program/Area of Concern/Point of Interest (IRP/AOC/POI) sites, unexploded ordnance (UXO), roads, targets, facilities, and munitions constituents (chemicals).

3.2 SETTING DESCRIPTION

Test Areas A-77, A-78, and A-79 are located in the southwest portion of Eglin AFB and Test Area B-7 is situated in the northwest portion of the base in Okaloosa and Santa Rosa counties, Florida (Figures 1-1 and 1-2; 3-1 through 3-4). TA A-77, A-78, and B-7 are mostly cleared, relatively flat, and lack surface water. Open Grasslands/Shrublands make up the majority of land cover on these test areas. The cleared areas consist of target areas, roadways, and bunkers established over the grassy plains and vegetation species of broomsedge, switch grass, grasses and herbs, and low-growing shrubs. TA A-79 is primarily wooded property that surrounds Johnson's Pond and a clay pit where training activities take place. The headwaters of Panther Creek are located on A-79 and the creek runs south through the center of the test area. The uncleared portions of all four of the test areas contain forests of longleaf pine, live oaks, and turkey oaks belonging to the Sandhills ecological association, described in further detail under the Biological Resources section.

Various targets are located on test areas A-77, A-78, and B-7. Materials used as targets include various types of vehicles, trucks, tanks, and bridge tracks. The particular type of targets used at each site changes constantly because when the materials reach a decimated, non-useable state, they are removed from the area and placed at the boundary of the test areas. All targets are scheduled for routine use and all are authorized for use of high explosives. No high explosive bombs are currently used on any of the target areas for Air to Ground Gunnery (ATGG) purposes.

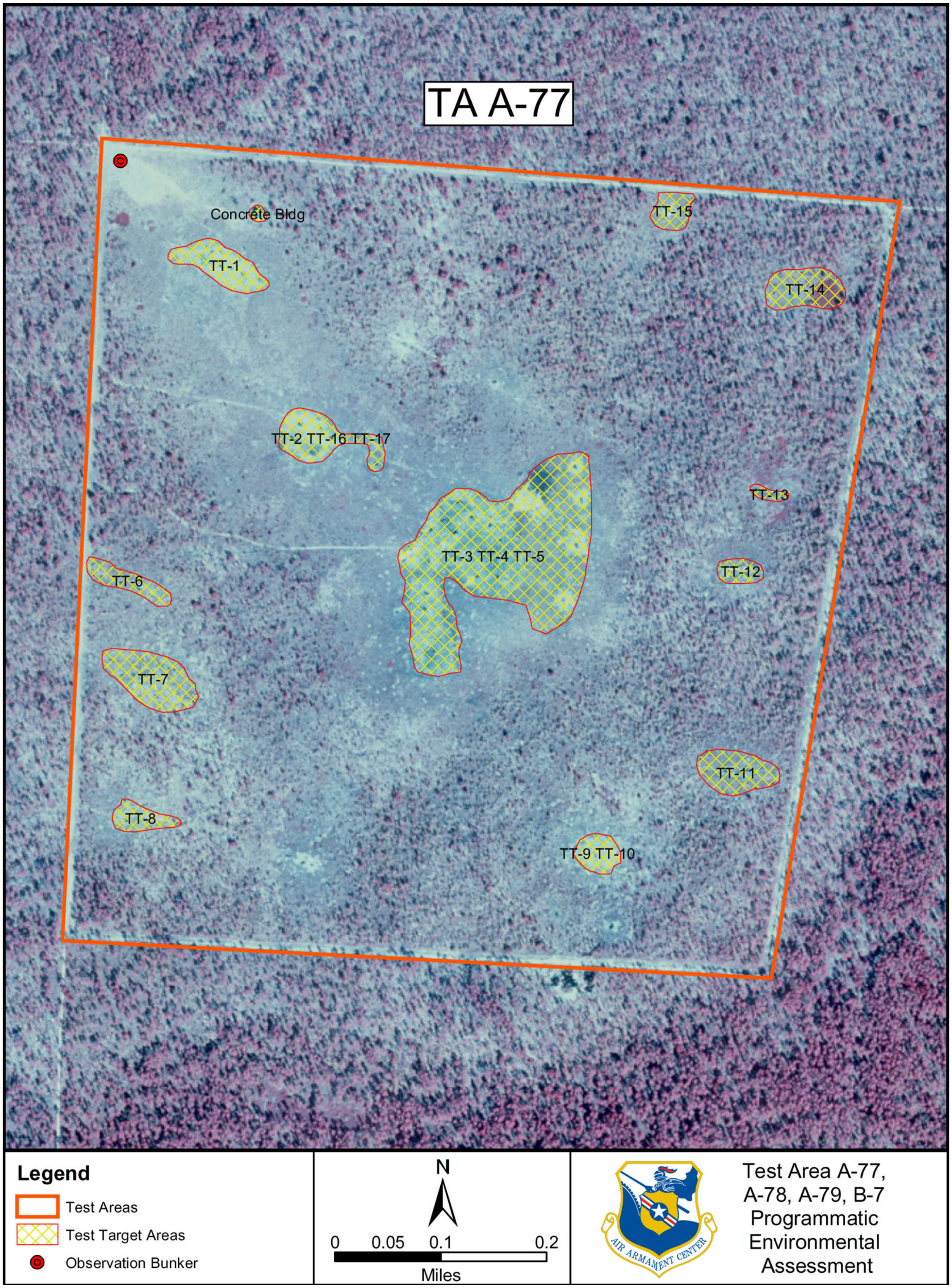

Figure 3-1. Test Area A-77

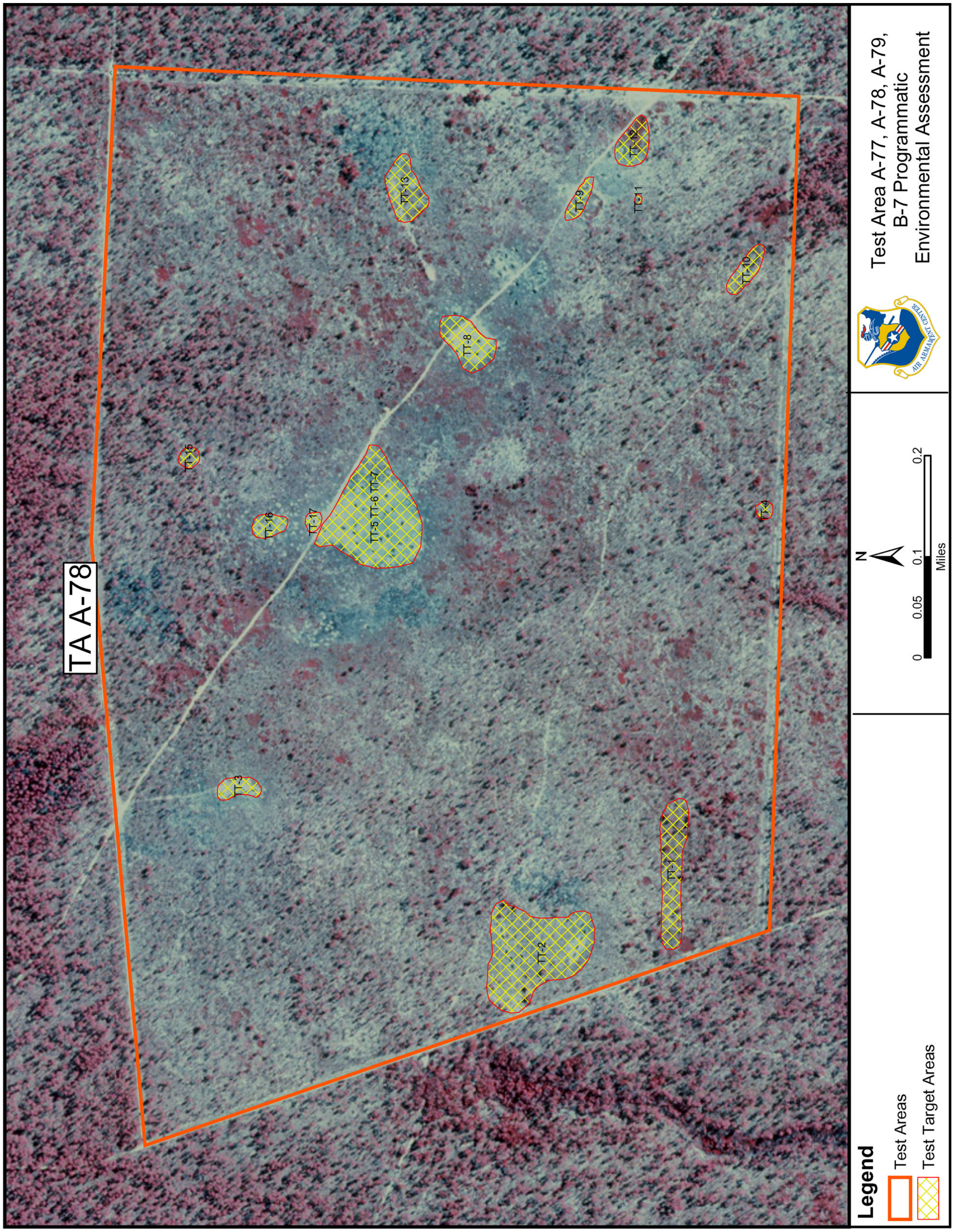

Figure 3-2. Test Area A-78

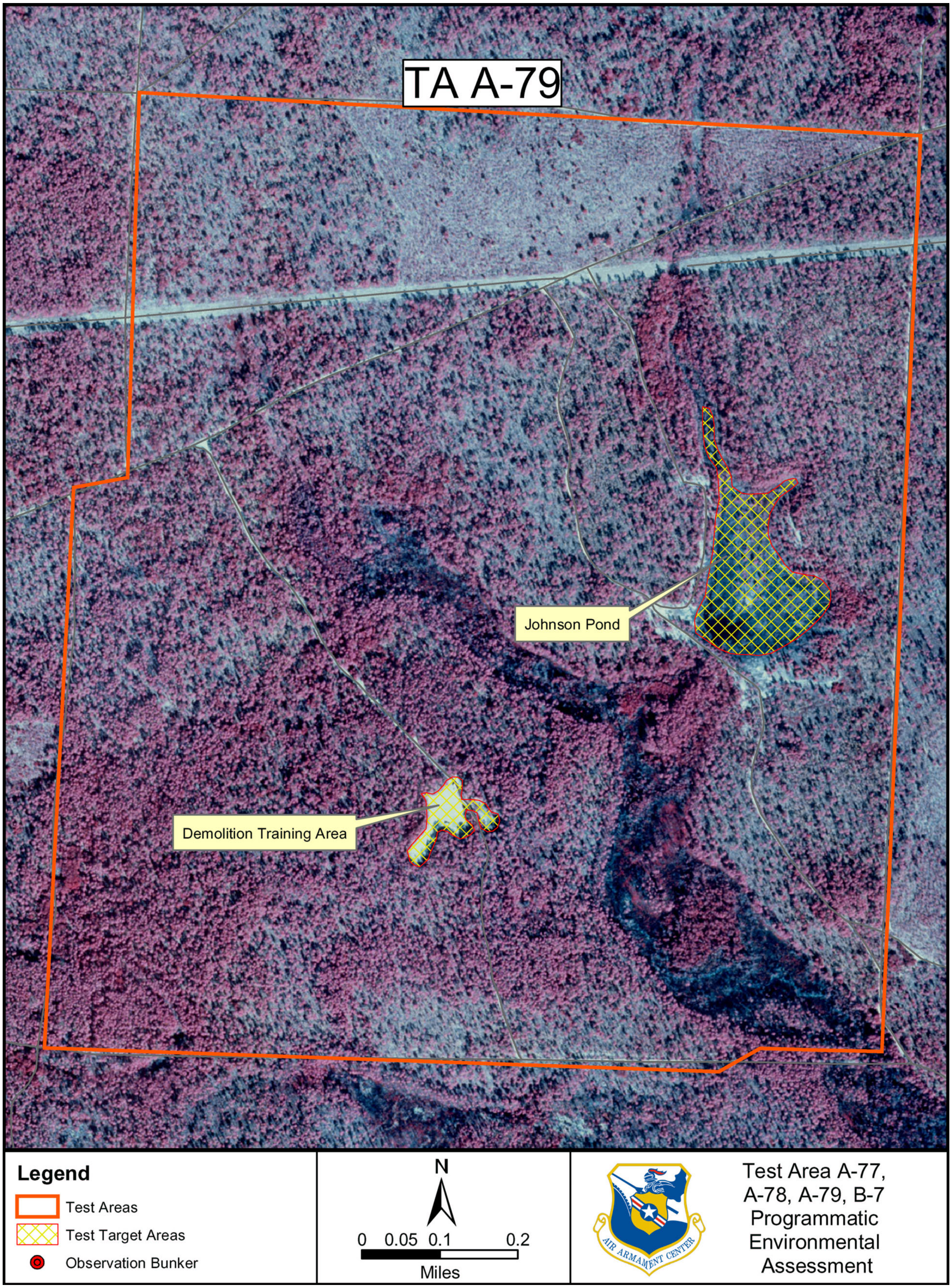

Figure 3-3. Test Area A-79

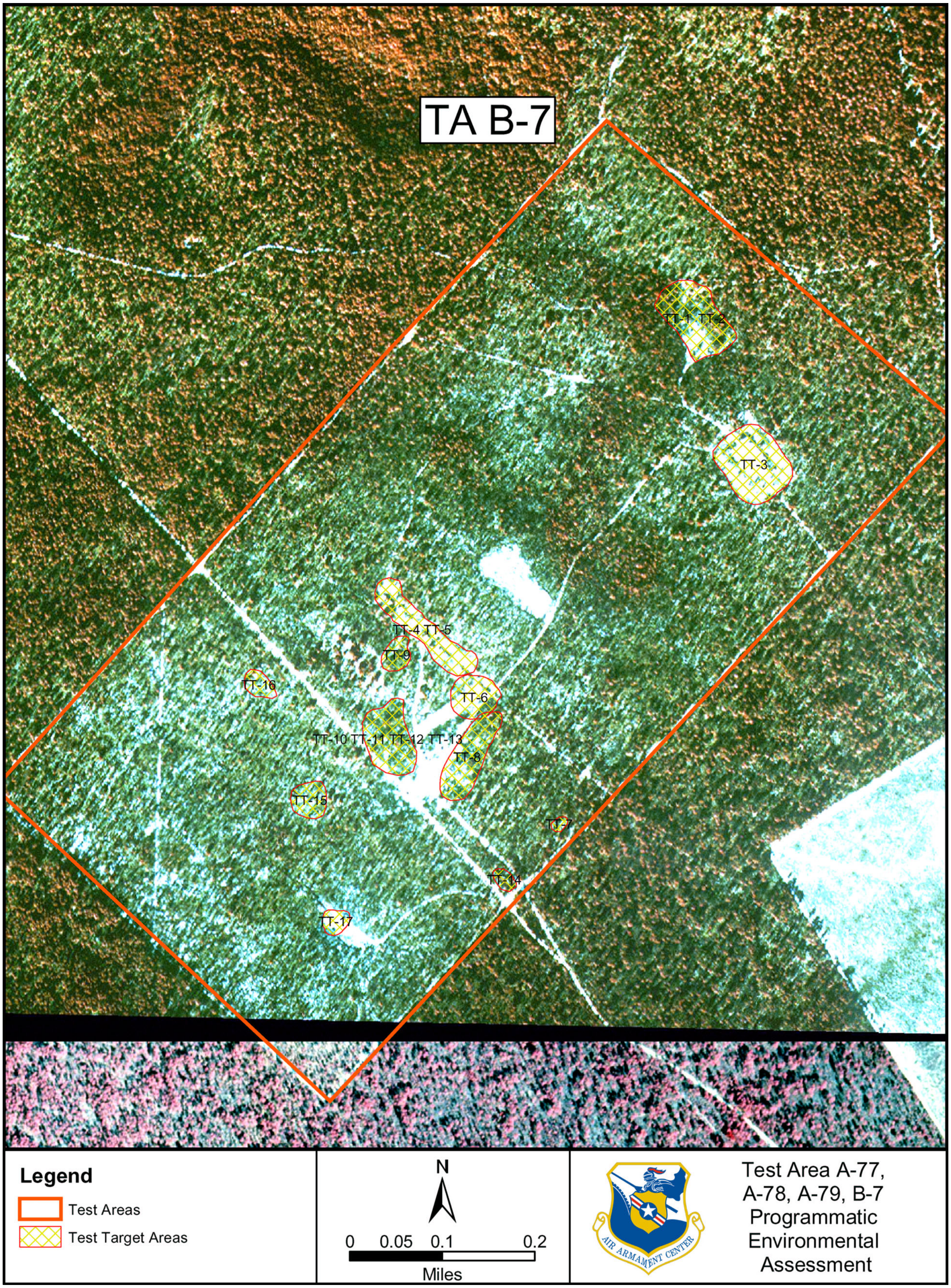

Figure 3-4. Test Area B-7

Table 3-1 provides detailed information about targets on the test areas. Pictorial representations of targets are located in Appendix D.

Table 3-1. Target Areas on A-77, A-78, A-79, and B-7

Test Area	Target Area	Target Type
A-77	TT-01, TT-02, TT-03, TT-04, TT-05, TT-06, TT-07, TT-08, TT-11, TT-12, TT-13, TT-14, TT-15, TT-16, TT-17, TT-18	Tactical Gun, Rocket Targets
	TT-09, TT-10	Tactical Targets
A-78	TT-01, TT-02, TT-03, TT-04, TT-05, TT-06, TT-07, TT-08, TT-10, TT-11, TT-12, TT-13, TT-14, TT-15, TT-16, TT-17	Tactical Gun, Rocket Targets
	TT-09	Tactical Gun, Rocket Targets Dive Bomb area
A-79		Air-to-Water Target
B-7	TT-01, TT-02, TT-03, TT-04, TT-05, TT-06, TT-07, TT-08, TT-09, TT-10, TT-11, TT-12, TT-13, TT-14, TT-15, TT-16, TT-17, TT-18	Tactical Gun, Rocket Targets

Additional information on Eglin's property is available in the Integrated Natural Resources Management Plan (INRMP), Eglin AFB, 2002–2006 (U.S. Air Force, 2002). Due to the military use of these test areas, they are closed to hunting, fishing, and outdoor recreation, and all unauthorized activities.

Target Area Radium Survey

Targets and test areas for the ATG missions were surveyed in 2001 for radium. Surveys were conducted on A-77, A-78, A-79, and B-7 following methodology outlined in AFI 13-212 Range Planning and Operations, AFI 40-201 Managing Radioactive Materials in the Air Force, and U.S. Air Force Radioisotope Committee (RIC) policy letter. Radium contamination was found on targets on A-77 and A-78. A group composed of members from the 96 AMDS/SGPB, the 46 TW/TSRS, the 46 TW/TSRF, the 46 TW/OG, the 96 CEG/CED, BAE SYSTEMS, and SOG Hurlburt Field was formed to remediate the radiation found. A cleanup of the radium was scheduled and included:

- Cleaning or removing all contaminated targets on A-77.
- Moving targets off the active range and stored outside of firing range, if unexploded ordnance impaired cleaning.
- Removing contaminated soil and verifying results by collecting soil samples at three locations with high radiation levels.
- Resampling two additional samples from elevated soil radium areas for verification.
- Installing fences and posting radiation signs around contaminated targets.
- Scheduling cleanup for TA-78.

At this time, all contaminated areas are fenced and marked. Soil samples received from resampling on A-77 were returned with a negative result for radium contamination. Actions needed on A-77 and A-78 include disposal of all radiological material collected as well as

addressing the legacy targets that require UXO and radiation removal. Currently, these actions have not occurred as funding for cleanup has not been received.

3.3 PHYSICAL FEATURES

3.3.1 Soils

Soil formation is an on-going process that is determined by the nature of the parent material and influence of environmental factors such as climate, geology, topography, and vegetation. Soils are mapped and identified as soil series and associations. There are five soil associations composed of nine different soil series on Eglin AFB. Each association or soil type represents a soil or a group of soil types that occur together geographically and form a distinctive pattern of landscape. The soil association is dominated by one to three similar soil series and interspersed with similar areas of less extensive contrasting soil. In the association, the soil series involved occur with some degree of regularity in proportion and arrangement.

The kinds and proportions of soil series in an association influence its suitability for various land uses. The primary soil series are described in the following narrative. The physical and chemical soil data for TA A-77, A-78, A-79, and B-7 is listed in Table 3-2.

Table 3-2. Physical and Chemical Data of Soils on TAs A-77, A-78, A-79, and B-7

Soil Type	Soil Depth (approx. inches)	Texture	Slope (%)	pH	Organic Matter (%)	Clay (%)	Permeability (inches/hour)
Lakeland	0 – 80	Sand, fine sand	0 – 30	4.5 – 6.0	<1	1 – 8	6 – 20
Troupe	0 – 80	Sand, sandy clay loam, sandy loam, fine sandy loam	0 – 40	4.5 – 6.0	3 – 9	1 – 35	0.6 – 20
Pactolus	0 – 80	Sand, loamy sand, loamy fine sand	0 – 5	3.5 – 5.5	0 – 2	2 – 12	6 – 20
Rutledge	0 – 80	Sand, loamy sand, loamy fine sand	0 – 2	3.6 – 5.5	3 – 9	2 – 10	6 – 20
Bonifay	0 – 80	Sandy loam, fine sandy loam, sandy clay	0 – 12	4.5 – 6.0	0.5 – 2	2 – 40	0.6 – 20
Foxworth	0 – 80	Sand, fine sand	0 – 25	4.5 – 6.5	0.5 – 2	1 – 8	>0.6

Lakeland Sand

Lakeland sand covers 100 percent of both TAs A-77 and B-7, 99 percent of TA A-78, and 75 percent of TA A-79. This sandy, very deep, excessively drained, rapidly permeable soil formed in sandy marine, fluvial, and/or eolian sediments, occupying generally level to steep slopes ranging from 0 to 12 percent. The soil typically contains 95 percent or more quartz or other insoluble minerals and is loose and incoherent. These soils do not have a water table

within a depth of 80 inches. The resulting condition of a typical Lakeland soil is generally characterized as:

- poor soil structure (low cohesion, adhesion, and aggregate stability).
- very low fertility.
- very high leaching potential.
- relatively low diversity, activity, and populations of soil microbes, arthropods, and earthworms.
- the absence of active soil-forming processes.

Troup

Troupe sand comprises 6 percent of soils on TA A-79 and a small fraction (<1 percent) of soil on TA A-78. This soil type is deep, somewhat excessively drained, and moderately permeable with thick sandy surface and subsurface layers and loamy subsoils that formed in consolidated sandy and loamy marine sediments. Slopes are typically convex, moderate 3 percent or less, but can change to greater than 20 percent.

Foxworth Sand – Bonifay Loamy Sand – Pactolus Loamy Sand

Foxworth Sand (TA A-78), Bonifay Loamy Sand (TA A-79), and Pactolus Loamy Sand (TA A-79) are located on the test areas in very small fractions and are described in Table 3-2.

3.3.2 Hydrology

Florida is well known for its crystal clear, sandy bottom streams and rivers and quality drinking water. The value of these waterways and related groundwater systems are innately linked to various environmental regulations (endangered species), socioeconomics (silviculture), aesthetics and recreation, water resources (drinking water, transportation, and irrigation), military mission activities of Eglin, and other issues. The attributes of the hydrologic and geohydrologic systems found on TAs A-77, A-78, A-79, and B-7 are discussed in the following narrative.

Geohydrology

Once water moves below the realm of the surface and into the vertical zones of the soil and geologic formations, it becomes soil water and groundwater. These geohydrologic layers are known as the vadose zone (soil water) and phreatic zone (groundwater).

Soil Water and Groundwater

Soil water is the unsaturated (vadose) zone beginning just below the surface at the point of water entry into the soil by means of infiltration. This zone is defined as unsaturated because soil pore spaces are only partially filled with water. The rate of infiltration is dependent on the soil type and amount of moisture present; a dry soil would have a relatively high infiltration rate. Following infiltration into the soil, water moves through the profile by means of percolation.

Beneath the unsaturated zone lies the saturated (phreatic) zone. All the pore spaces in this zone are filled with water. The top surface of the saturated zone is called the water table and the water below is called groundwater.

Aquifers

The northwest Florida aquifers associated with southern Santa Rosa County and Okaloosa County are divided into four hydrostratigraphic units. In descending order from the surface, these units are the:

- Surficial Aquifer (the Sand and Gravel Aquifer).
- Intermediate System.
- Floridan Aquifer.
- SubFloridan System.

The Surficial Aquifer (the Sand and Gravel Aquifer) and Floridan Aquifer move and store substantial amounts of water because of their medium to high permeability, whereas the Intermediate and SubFloridan Systems are primary confining units of the aquifer system that have low permeability. The primary water supply for northwest Florida comes from the Surficial and Floridan Aquifers.

The two aquifers located under the test areas are the Sand and Gravel Aquifer and the Floridan Aquifer. Eglin uses only a small amount of water from the Sand and Gravel Aquifer; however, the Floridan Aquifer is used extensively. The Floridan Aquifer is located below the Sand and Gravel Aquifer and extends beneath most of Florida.

<u>Sand and Gravel Aquifer</u>

The Sand and Gravel Aquifer consists of the Citronelle formation and marine terrace deposits that reach a maximum thickness of 1,200 feet at Mobile Bay, Alabama (U.S. Air Force, 1995). Although the aquifer is composed of clean, fine to coarse sand and gravel, locally it contains some silt, silty clay, and peat beds. The Sand and Gravel Aquifer is segregated from the underlying limestone of the Floridan Aquifer by the Pensacola Clay confining bed. Water in the Sand and Gravel Aquifer exists in generally unconfined (free water surface or water table conditions) and confined (under pressure) conditions (Becker et al., 1989). It is vulnerable to contamination from surface pollutants (Becker et al., 1989; U.S. Air Force, 1995). Pollutants enter the Sand and Gravel Aquifer by percolating downward through the sandy soils. They then migrate laterally in the groundwater and enter surface waters through base flow that provides most of the water to area streams and creeks. Wildlife habitat and vegetation provided by the streams can be affected by the pollutants in the surface water (U.S. Air Force, 1995).

Where the aquifer is in direct contact with surface water, such as a stream or Choctawhatchee Bay, water table conditions occur (Becker et al., 1989). In the Coastal Lowlands region, where TAs A-77, A-78, and A-79 are located, the water table is at or within a few feet of land surface. In the Western Highlands region (TA B-7), the water table may occur at considerable depth below land surface (U.S. Air Force, 1995). Lakes and ponds occur where local shallow clay and silt layers restrict the downward movement of water to the regional water table.

The quality of water in the aquifer has been rated good (i.e., meets its intended use) by the Florida Department of Environmental Protection (FDEP) (U.S. Air Force, 1995). Water from this aquifer is not a primary source of domestic or public supply water on Eglin because of the large quantities of higher quality water available from the underlying Upper Limestone of the Floridan Aquifer (Becker et al., 1989; U.S. Air Force, 1995).

Floridan Aquifer

The Floridan Aquifer, Eglin's sole drinking water source, consists of a thick sequence of interbedded limestone and dolomites. Throughout the Eglin reservation, the Floridan Aquifer exists under confined conditions, bounded above and below by the Pensacola Clay confining bed. This clay layer restricts the downward migration of pollutants and restricts saline water from Choctawhatchee Bay and the Gulf of Mexico from entering the Upper Limestone layer of the aquifer. The clay layer of the Bucatunna Formation separates the Upper and Lower Limestone units. Because it is saline, the Lower Limestone unit is not used as a water source (U.S. Air Force, 1995). Groundwater storage and movement in the Upper Limestone layer occurs in interconnected, intergranular pore spaces, small solution fissures, and larger solution channels and cavities. Water quality for raw water drawn from the upper limestone of the Floridan aquifer is of suitable quality for most uses.

Groundwater Contamination

Contamination of the Sand and Gravel Aquifer has occurred through past base-related activities. Several base Installation Restoration Program (IRP) sites report various amounts of pesticides, heavy metals, petroleum hydrocarbons, and other compounds throughout the Eglin land test areas (U.S. Air Force, 1995). Figure 3-5 shows IRP sites on A-77, A-78, A-79, and B-7. Additional information on IRP sites is available in Section 3.5.4 and Appendix H.

Water Use

There are no potable water wells located on TAs A-77, A-78, A-79, or B-7.

Surface Water

Surface water is any water that lies above groundwater, such as ponds, rivers, streams, and springs or artificial containments. Surface water hydrology on Eglin AFB is directly linked to geology and geomorphology. Lakes, ponds, and wetlands occur where local shallow clay and silt layers restrict the downward movement of water to the regional water table. The hydrologic characteristics of each drainage basin can be directly related to watershed geology and drainage density.

Most of these streams are classified as seepage streams, which are characterized as perennial or intermittent seasonal watercourses, originating from shallow ground waters that have percolated through deep, sandy, upland soils. These streams are typically clear to lightly colored, and are relative short, shallow, and narrow. Stream flow remains fairly constant all year in these streams because of a close relationship between groundwater and surface water. Rainfall rapidly infiltrates the soil profile to recharge the shallow groundwater. The stored groundwater is released slowly to the surface water (Becker et al., 1989).

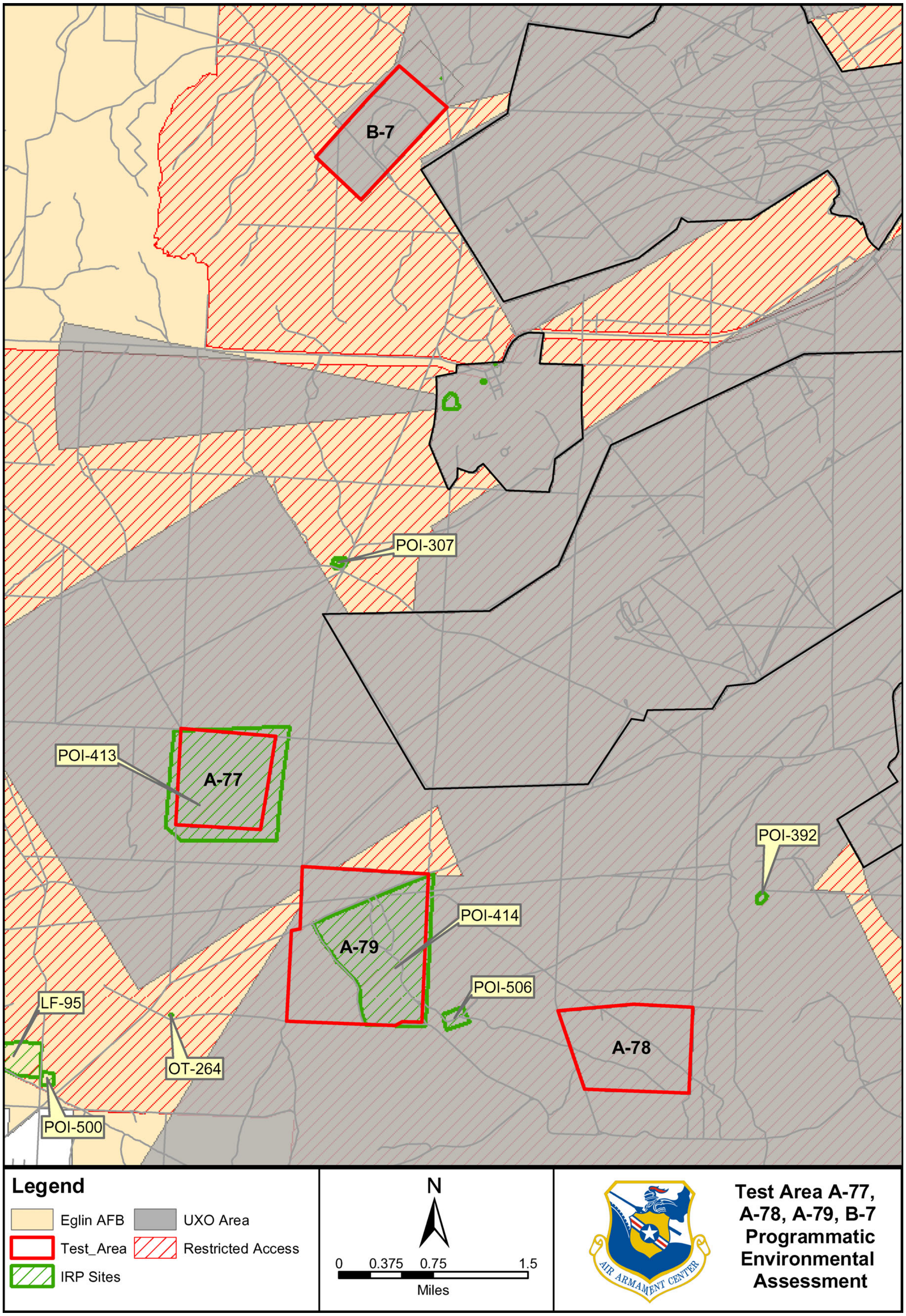

Figure 3-5. IRP Sites on A-77, A-78, A-79, and B-7

TA A-77 drains into Indigo Creek, which discharges to the Yellow River. TA A-78 drains into East Bay Swamp, and ultimately into the East Bay River. Johnson's Pond, located in the northeast corner of A-79, provides a headwater and tributary for Panther Creek, which feeds into the East Bay River. Johnson's Pond has been flooded by means of a gated weir in the past for use as an air-to-water test area. Boiling Creek drains the area south of TA B-7 into the Yellow River. Headwaters of Bear Creek occur at the northern corner of TA B-7. All surface waters are shown in Figure 3-6.

Outstanding Florida Waters (OFWs)

Waters listed as OFWs include surface waters in national parks, aquatic preserves, wildlife refuges, marine sanctuaries, wild and scenic rivers, state aquatic preserves, and waters in areas acquired through donation, trade, or purchase. It is the FDEP's policy to afford the highest protection to Outstanding Florida Waters. No degradation of water quality, other than that allowed in Rule 62-4.2.4.2(1) and (2), is permitted in these waters. The Yellow River Marsh Aquatic Preserve, an Outstanding Florida Water, is immediately adjacent to Eglin. TAs B-7 and A-77 drain into streams that feed into the Yellow River.

Surface Water Quality

Water quality is a measurement of the chemical and physical characteristics of a water mass that describes its suitability for specific uses. The state of Florida has developed and retains primacy for surface water quality standards for all waters of the state (Florida Administrative Code (FAC) 62-301 and FAC 62-302) in accordance with the provisions of the Clean Water Act. A scoring system based on the data in the *Florida Water Quality Assessment, 2000 305 (b) Report* is used by FDEP to rate the quality of surface waters of the state. Florida surface waters were rated as follows.

- Fully meets use
- Partially meets use
- Does not meet use
- Insufficient data

Based on the above classification system, the surface water quality of rivers, streams, creeks, bayous, and bays in the Region of Influence was rated by the state. The report delineated large basins and numerous sub-basins for each of the five water districts in the state. According to the 2000 Florida Water Quality Assessment 305(b) Main Report and Technical Appendix (FDEP, 2000), Test Areas B-7 and A-78 fully meet water quality standards. However, water quality data for Test Areas A-77 and A-79 were lacking such that assessments could not be made.

The streams on Test Areas A-77, A-78, A-79, or B-7 are defined as Class III (recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife) (FDEP, 2000). An August 2003 biological assessment on Panther Creek at Eglin Road 678 downstream of Test Area A-79 indicated a healthy biological community (FDEP, 2000).

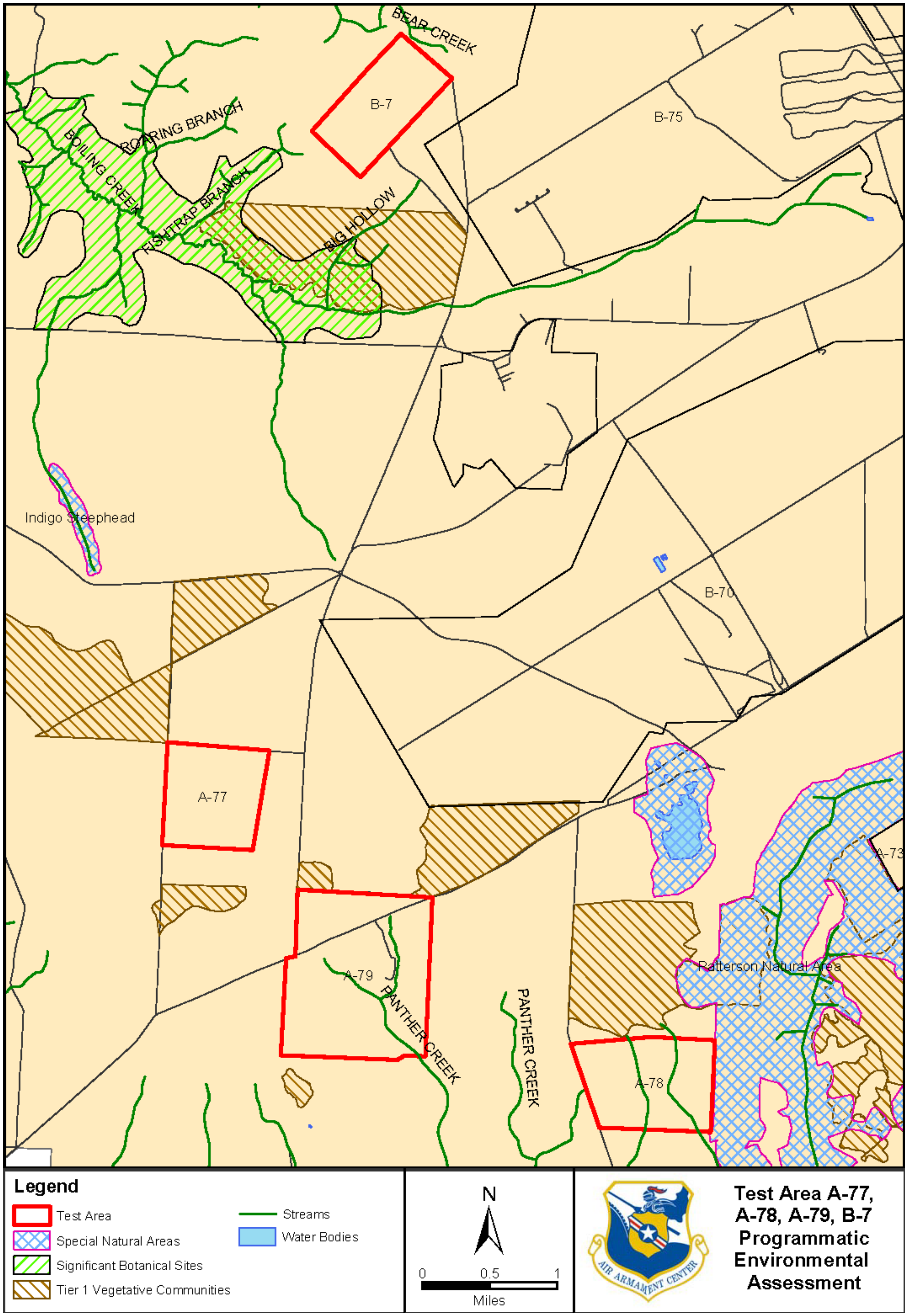

Figure 3-6. Waterbodies, Streams, and Vegetation/Wetlands on Test Areas A-77, A-78, A-79, and B-7

This site met Class III State Water Quality Standards 62-302 for recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife (FDEP, 2000). Water quality criteria for Class III waters are presented in Table 3-3.

Table 3-3. Water Quality Criteria for Class III Waters

Parameter	Units	Class III
Turbidity	Nephelometric Turbidity Unit (NTU)	≤29 above background
Dissolved Solids	milligrams per liter (mg/L)	None
pH	pH units	No more than one unit change above or below background
Chlorides	mg/L	None
Fluorides	mg/L	≤10.0
Conductivity	Micromho	No increase above 50% of background or 1,275
Dissolved Oxygen (DO)	mg/L	Not less than 5.0
BOD	mg/L	No increase such that DO drops below limit for any class.
Nutrients: Total Phosphorus, Total Nitrogen		No alteration in nutrients such that an imbalance in natural populations of aquatic flora or fauna results.
Total Coliform	#/100 mL	≤2,400 in any one sample
Fecal Coliform	#/100 mL	≤800 in any one sample
Copper	micrograms per liter (µg/L)	≤(.8545(in hardness) – 1.465)
Iron	mg/L	≤1.0
Lead	µg/L	(1.273(in hardness) – 4. 705)
Zinc	µg/L	(0.8473(in hardness) + 0.7614)
Mercury	µg/L	≤0.012

Source: FDEP, 2000

3.3.3 Climate and Meteorology

Eglin is located in a transitional zone between temperate and subtropical climates. The climate is characterized by warm, humid summers and mild winters, prevailing southerly winds, and intense thunderstorm events and hurricane cycles (U.S. Air Force, 1995). The most intense of these are tropical cyclones, which include tropical storms and hurricanes. Tropical cyclones are less recurrent than their winter counterparts (extratropical cyclones), but are more intense. Hurricane season begins 1 June and lasts through 30 November.

Data analyzed over the last 100 years indicate that the Gulf experiences an average of 17.7 storms annually, with each having a mean duration of 4.8 days (FAMU, 1988). The period of 1991 to 1994 was one of the least active for hurricanes on record. However, in 1995, Hurricanes Allison, Erin, and Opal all made landfall in the Florida panhandle, causing extensive damage to property, dunes, and natural resources in the area.

Temperatures range from a minimum average temperature near 36°F (degrees Fahrenheit) (2 degrees Celsius) in the winter to a maximum average temperature near 91°F (33°C) in the summer (Table 3-4). Occasional frosts occur between November and February (Becker et al., 1989). Winter temperatures can reach as low as 15°F to 20°F with temperatures dropping to single digits during brief winter cold fronts (U.S. Air Force, 1996). The relative humidity is high

throughout the year. By early June, the temperature-humidity index (THI) is about 79 and remains between 79 and 81 during most afternoon hours until late September.

Rainfall

Rains occur primarily during the summer (June to August) and the late winter to early spring (February to April) and result from frontal-type weather systems and thunderstorms (Becker et al., 1989). Frontal storms cover a larger area and produce showers of longer duration and lower intensity than thunderstorms. The majority of summer rainfall is from intense thunderstorms in the late afternoon or early evening that last only one or two hours. The natural pH of Florida rainwater is 4.65 to 4.75 (Becker et al., 1994).

Based on data collected at the National Weather Service Cooperative Observation Site, Niceville, Florida, located a few miles due east of Eglin, the annual rainfall ranges from 65 to 84 inches (Becker et al., 1994). The data also shows the large variation in annual rainfall totals from year to year (Table 3-4).

Table 3-4. Monthly Summary of Temperature and Precipitation

Month	Average High (F)	Average Low (F)	Mean (F)	Average Precipitation	Record High (F)	Record Low (F)
January	60°	36°	49°	5.00 inches	80° (1957)	4° (1985)
February	63°	39°	52°	5.80 inches	83° (1980)	11° (1951)
March	70°	46°	58°	5.80 inches	87° (1986)	19° (1980)
April	77°	53°	66°	3.70 inches	92° (1985)	20° (1987)
May	84°	61°	73°	4.00 inches	101° (1953)	38° (1971)
June	90°	67°	79°	6.10 inches	102° (1969)	48° (1984)
July	91°	70°	81°	8.50 inches	107° (1980)	55° (1967)
August	90°	70°	81°	7.20 inches	103° (1980)	59° (1989)
September	88°	66°	77°	5.80 inches	102° (1954)	37° (1967)
October	80°	53°	67°	4.30 inches	99° (1954)	27° (1989)
November	71°	46°	59°	4.10 inches	89° (1998)	18° (1950)
December	63°	39°	52°	4.80 inches	84° (1968)	8° (1962)

Source: The Weather Channel Interactive, Inc. www.weather.com

Lightning

The high-intensity storms that frequent this area not only deliver significant amounts of rain, they also create frequent air-to-ground lightning strikes. The heat from these electrical discharge events reaches 20,000°C, which is three times the temperature of the surface of the sun. Contact with fuel sources such as timber can easily start wildfires.

Instances of violent storms and wildfires have been described by many of the early explorers of Florida, with recent history having shown that wildfires can still have widespread, devastating effects on the landscape. Lightning-ignited wildfires have occurred on Eglin, and the potential does exist for lightning to ignite wildfires on or near the TAs.

Winds

Prevailing winds are usually from the south in summer and the north in winter. Warm westerly winds originate from the Gulf of Mexico during the summer, providing cooling onshore breezes

along the coast. The Gulf moderates extremes in winter temperatures by providing heat in the winter. Winds from the northwest bring frontal systems of low precipitation and long duration in the winter. The lowest average velocity winds occur in August, and the windiest month is March.

For northwest Florida, daytime mixing heights—the height of the layer whereby the atmosphere will be well mixed—are higher than for most of the continental United States. Average morning mixing heights for northwest Florida range from 500 to 1,000 meters (1,600 to 3,300 feet) above ground level (AGL) in the summer to 500 to 700 meters (1,600 to 2,300 feet) AGL in the winter. Average afternoon mixing heights are from 800 to 1,000 meters (2,600 to 3,300 feet) AGL in the winter to 1,400 to 1,600 meters (4,600 to 5,200 feet) AGL in the summer. Prevailing winds are usually from the north in winter and from the south in summer with an annual average wind speed of five knots. January, February, March, April, and December are the windiest months with an average wind speed of 6 knots. July and August have the lowest average velocity winds at 4 knots (U.S. Air Force, 2003).

Inversions

Almost every morning, ground-based inversions occur at Eglin and break during the morning with surface heating. When the air temperature increases with height at a rate such that the air remains very stable and little mixing of the air occurs, there is an inversion. Ground-based inversions occur due to radiative cooling at the ground. For approximately five to seven days in the winter, the inversion does not break up due to a deep layer of sea fog that slows surface heating. Low wind speeds in these situations are typical (U.S. Air Force, 1995).

3.3.4 Air Quality

Air quality in a given location is described by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or micrograms per cubic centimeter. Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

Identifying the affected area for an air quality assessment requires knowledge of pollutant types, source emissions rates and release parameters, proximity relationships of project emission sources to other emissions sources, and local and regional meteorological conditions. For inert pollutants (those that do not participate in photochemical reactions, i.e., all pollutants other than ozone and its precursors), the affected area is generally limited to an area extending a few miles downwind from the source.

Pollutant concentrations are compared to federal and state ambient air quality standards to determine potential affects. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare, with a reasonable margin of safety. The national ambient air quality standards (NAAQS) are established by the U.S. Environmental Protection Agency (USEPA). In order to protect public health and welfare, USEPA has developed numerical concentration-based standards or NAAQS for six "criteria" pollutants (based on health-related criteria) under the provisions of the Clean Air Act Amendments of 1970 (CAA). There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient

air to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. NAAQS have been established for: (1) ozone (O_3), (2) nitrogen dioxide (NO_2), (3) carbon monoxide (CO), (4) sulfur oxides (SO_x) measured as sulfur dioxide (SO_2), (5) lead (Pb), and (6) particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}) (Table 3-5). The NAAQS are the cornerstone of the CAA. Although not directly enforceable, they are the benchmark for the establishment of emission limitations by the states for the pollutants that USEPA determines may endanger public health or welfare.

Table 3-5. National and Florida Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS[1,2,3]	Federal Secondary NAAQS[1,2,4]	Florida Standards
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	No standard No standard	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)
Lead (Pb)	Quarterly	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)
Ozone (O_3)	1-hour[5] 8-hour[6]	0.12 ppm (235 µg/m^3) 0.08 ppm (157 µg/m^3)	0.12 ppm (235 µg/m^3) 0.08 ppm (157 µg/m^3)	0.12 ppm (235 µg/m^3) 0.08 ppm (157 µg/m^3)
Particulate Matter ≤10 Micrometers (PM_{10})	Annual 24-hour[7]	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3
Particulate Matter ≤2.5 Micrometers ($PM_{2.5}$)	Annual 24-hour[8]	15 µg/m^3 65 µg/m^3	15 µg/m^3 65 µg/m^3	15 µg/m^3 65 µg/m^3
Sulfur Dioxide (SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 µg/m^3) 0.14 ppm (365 µg/m^3) No standard	No standard No standard 0.50 ppm (1300 µg/m^3)	0.02 ppm (60 µg/m^3) 0.10 ppm (260 µg/m^3) 0.50 ppm (1300 µg/m^3)

Source: FDEP, 2000a; USEPA, 2003 (web site: www.epa.gov/air/criteria.html)

1. National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1. The USEPA has been given the authority by the federal courts to proceed with the implementation of the new 8-hour ozone standard and the $PM_{2.5}$ standard; however, they have not been implemented at this point and are included for information only.
2. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury; ppm refers to parts per million by volume.
3. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.
4. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
5. The ozone 1-hour standard still applies to areas that were designated nonattainment when the ozone 8-hour standard was adopted in July 1997.
6. The ozone 8-hour standard is attained when the fourth highest 8-hour concentration in a year, averaged over three years, is equal to or less than the standard.
7. The PM_{10} 24-hour standard is attained when 99 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
8. The $PM_{2.5}$ 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard

Florida has adopted the NAAQS except for sulfur dioxide (SO_2). USEPA has set the annual and 24-hour standards for SO_2 at 0.03 ppm (80 micrograms per cubic meter (µg/m^3)) and 0.14 ppm (365 µg/m^3), respectively. Florida has adopted the more stringent annual and 24-hour standards of 0.02 ppm (60 µg/m^3) and 0.01 ppm (260 µg/m^3), respectively. In addition, Florida has adopted the national secondary standard of 0.50 ppm (1,300 µg/m^3).

The fundamental method by which USEPA tracks compliance with the NAAQS is the designation of a particular region as "attainment," "nonattainment," or "unclassifiable." Areas meeting or having better air quality than the NAAQS are said to be in attainment. Areas that exceed the NAAQS are said to be in nonattainment. Areas that cannot be classified on the basis of available information as attainment or nonattainment are defined as unclassifiable and are treated as attainment areas. Attainment areas can be further classified as maintenance areas. Maintenance areas are areas that were previously nonattainment but have reduced pollutant concentrations below the standard and must maintain some of the nonattainment area plans to stay in compliance.

Information regarding the coastal areas of the northern Gulf indicates that most incidences of poor air quality are associated with large metropolitan areas (SAI et al., 1995). Sources of emissions within the ROI include aircraft emissions and combustive and explosive by-products from munitions, flares, and pyrotechnic items. The designated ROI encompasses Santa Rosa and Okaloosa counties. Table 3-6 provides combined emissions from both counties.

Table 3-6. Okaloosa and Santa Rosa Counties Combined Emissions

County	Tons/Yr				
	NO_x	CO	PM_{10}	VOC	SO_2
Okaloosa	7,716.55	136,952.46	16,512.59	18,217.72	552.73
Santa Rosa	11,861.49	86,712.77	7,607.90	6,572.03	4,119.66
Totals	**19,578.04**	**223,665.22**	**24,120.48**	**24,789.76**	**4,672.39**

3.4 BIOLOGICAL RESOURCES

This section describes the sensitive habitats and wildlife resources that make up the biological component of the TA A-77, A-78, A-79, and B-7 landscape. Biological resources include the native and introduced terrestrial plants and animals around Eglin AFB. The land areas at Eglin are home to unusually diverse biological resources including several sensitive species and habitats. Eglin uses a classification system of ecological associations that were developed based on floral, faunal, and geophysical characteristics. These ecological associations are described in the *Integrated Natural Resources Management Plan, Eglin AFB, 2002-2006* (U.S. Air Force, 2002) and the *Environmental Baseline Study Resource Appendices* (U.S. Air Force, 1995).

Ecological Associations

Eglin has seven major ecological associations; however, only the Sandhills, Open Grassland, and Wetland and Riparian ecological associations are found within the area of concern. The majority of training activities would take place within the Sandhills and open grasslands (Figure 3-7). Table 3-7 provides an overview of the vegetative cover and sensitive habitats in each TA. Refer to Appendix G for descriptions of associated ecological associations.

Table 3-7. Vegetative Cover and Sensitive Habitats Found Near the Project Area

TA	Vegetative Cover	Sensitive Habitats on TA	Sensitive Habitats within 1 km of TA
A-77	45% cleared land 55% shrubland	None	Tier I vegetative communities
A-78	59% cleared land 10% forested land 30% shrubland	None	Tier I vegetative communities Special natural areas
A-79	1% cleared land 84% forested land 15% shrubland	Wetlands Floodplains	Wetlands Tier I vegetative communities Floodplains
B-7	6% cleared land 36% forested land 59% shrubland	None	Tier I vegetative communities Significant botanical site

Sensitive Habitats

Sensitive habitats found along, or adjacent to, the four TAs include wetlands, floodplains, special natural areas, FNAI Tier I vegetative communities, and FNAI Significant Botanical sites (U.S. Air Force, 1995). The management of sensitive habitats is the responsibility of AAC/EMSN, Natural Resources Branch of the Environmental Management Directorate.

Tier I Natural Communities

The Florida Natural Areas Inventory (FNAI) has surveyed Eglin AFB for occurrences of rare plants and important assemblages of plant communities. The mission of FNAI is to collect, interpret, and disseminate ecological information critical to the conservation of Florida's biological diversity (FNAI, 2001). FNAI maintains a statewide database on the distribution, status, and management of exemplary natural communities; endangered and rare plants and animal taxa; and managed areas in Florida. FNAI classifies land areas into the following four-tiered classification system (FNAI, 1995).

- ***Tier I:*** Vegetative communities that are in, or closely approximate, their natural state and undisturbed condition. The goal of management is to maintain the natural community. FNAI recommends that these areas be managed to maintain this natural state.
- ***Tier II:*** Vegetative communities that retain a good representation and distribution of associated species typical of the undisturbed state but have been exposed to moderate amounts and intensities of disruptive events. Through careful management, the community may be restored or maintained.
- ***Tier III:*** Vegetative communities that do not retain good representation and distribution of associated species and have been exposed to severe amounts and intensities of disruptive events. Significant and intensive management over extended periods would be required to restore these communities (e.g., pine plantations).
- ***Tier IV:*** Areas on Eglin that have a designated land use, such as TAs, developed areas, sewage disposal areas, roads, power line rights-of-way, and other uses. The nature of the designated use determines the management goal.

This classification system has been developed at Eglin AFB. Tier I vegetative communities are located adjacent to all four TAs (shown previously in Figure 3-6).

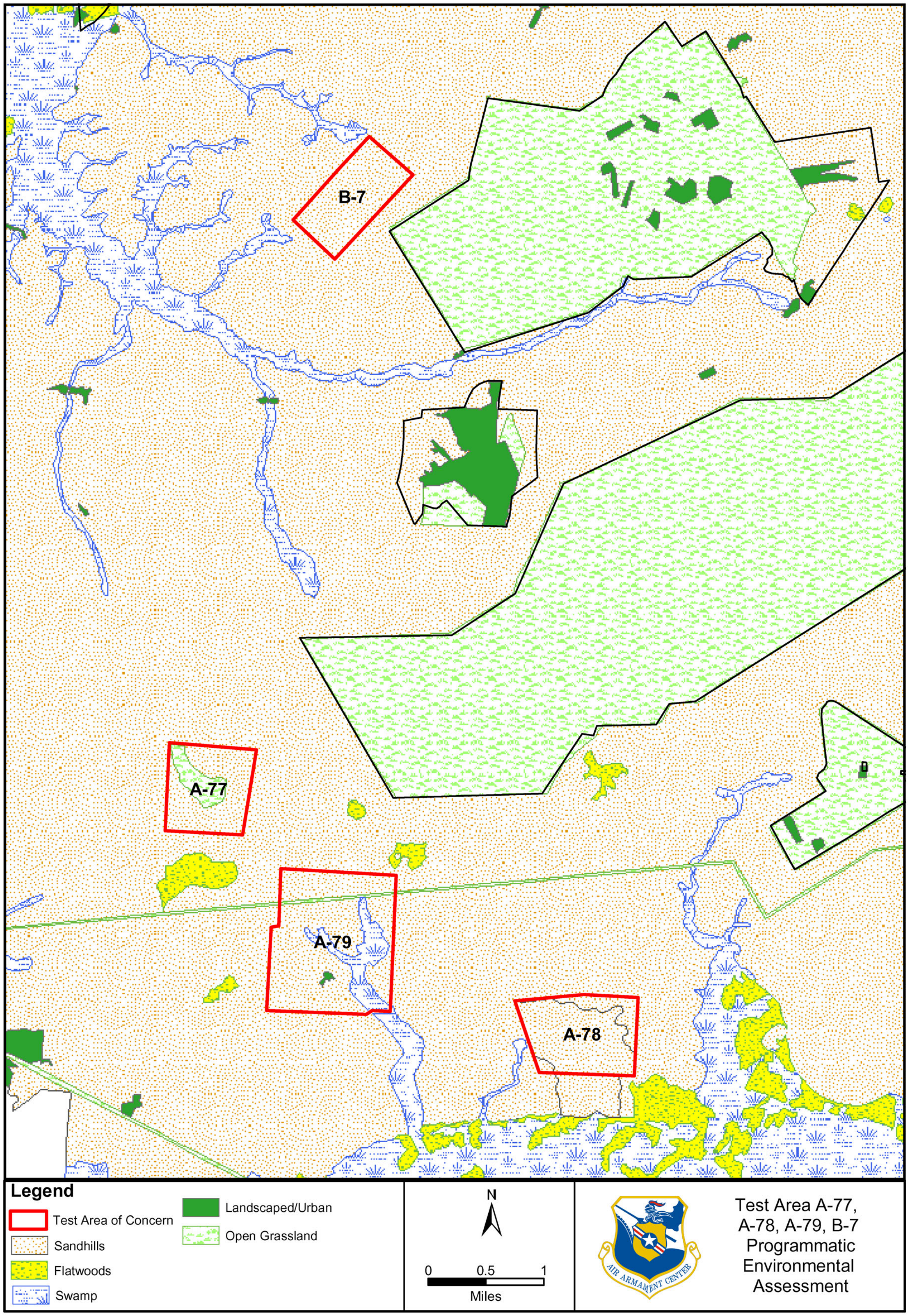

Figure 3-7. Ecological Associations in the Vicinity of Test Areas A-77, A-78, A-79, and B-7

Significant Botanical Sites

An FNAI survey was conducted at Eglin AFB from 1992 through 1994 for populations of federally listed endangered, threatened, and candidate plant species; state-listed endangered and threatened plant species; and other rare plant species (Chafin and Schotz, 1995). As a result of this survey, some areas on Eglin are considered to be significant botanical sites due to their value as habitat for rare plant species or because of the high quality or rarity of their natural vegetative communities on Eglin. Special protection at these sites is required for two reasons: (1) high density of federal- and state-protected plant species and (2) uniqueness of habitat that supports sensitive animals as well as plants. Habitat that supports federally listed animal species must be conserved in accordance with the federal Endangered Species Act (ESA). A significant botanical site is located south of B-7 and is shown in Figure 3-6.

Special Natural Areas

The area known as the Patterson Natural Area has been designated as a 5,000-acre Research Special Natural Area under the *Eglin Integrated Natural Resources Management Plan* (U.S. Air Force, 2002) due to the presence of its high quality old-growth longleaf pine. It encompasses several tracts of old growth immediately adjacent to the north and east of TA A-78 (Figure 3-6). Due to historical land-use patterns, Eglin AFB contains nearly 90 percent of the world's remnant old-growth longleaf pine ecosystems (Varner and Kush, 2001). Old-growth longleaf trees are those that are more than 150 years old. Eglin's two largest tracts of old growth are found just east of A-78 and north of A-77. These forests represent unique examples of old-growth longleaf pine sandhill habitat, and The Nature Conservancy identified these areas as reference sites for this imperiled ecological association (Provencher et al., 2000).

Wetlands

Wetland areas are sensitive habitat that are inundated (water covered) or where water is present either at or near the surface of the soil for distinguishable periods of time throughout the year. Local hydrology and soil saturation largely affects soil formation and development, as well as the plant and animal communities found in wetland areas. Hydric (wet), anaerobic (lacking oxygen) sediments resulting from the presence of water typify wetlands.

Wetlands support both aquatic and terrestrial organisms. Large varieties of microbes, vegetation, insects, amphibians, reptiles, birds, fish, and mammals can be found living in concert in wetland ecosystems. Through a combination of high nutrient levels, fluctuations in water depth, and primary productivity of plant life, wetlands provide the base of a complex food web, supporting the feeding and foraging habits of these animals for part of or all of their life cycles. During migration and breeding, many nonresident and transient bird and mammal species also rely on wetlands for food, water, and shelter. Wetland areas are located along the border of A-79 (Figure 3-8). For further information on this sensitive habitat, refer to Appendix G.

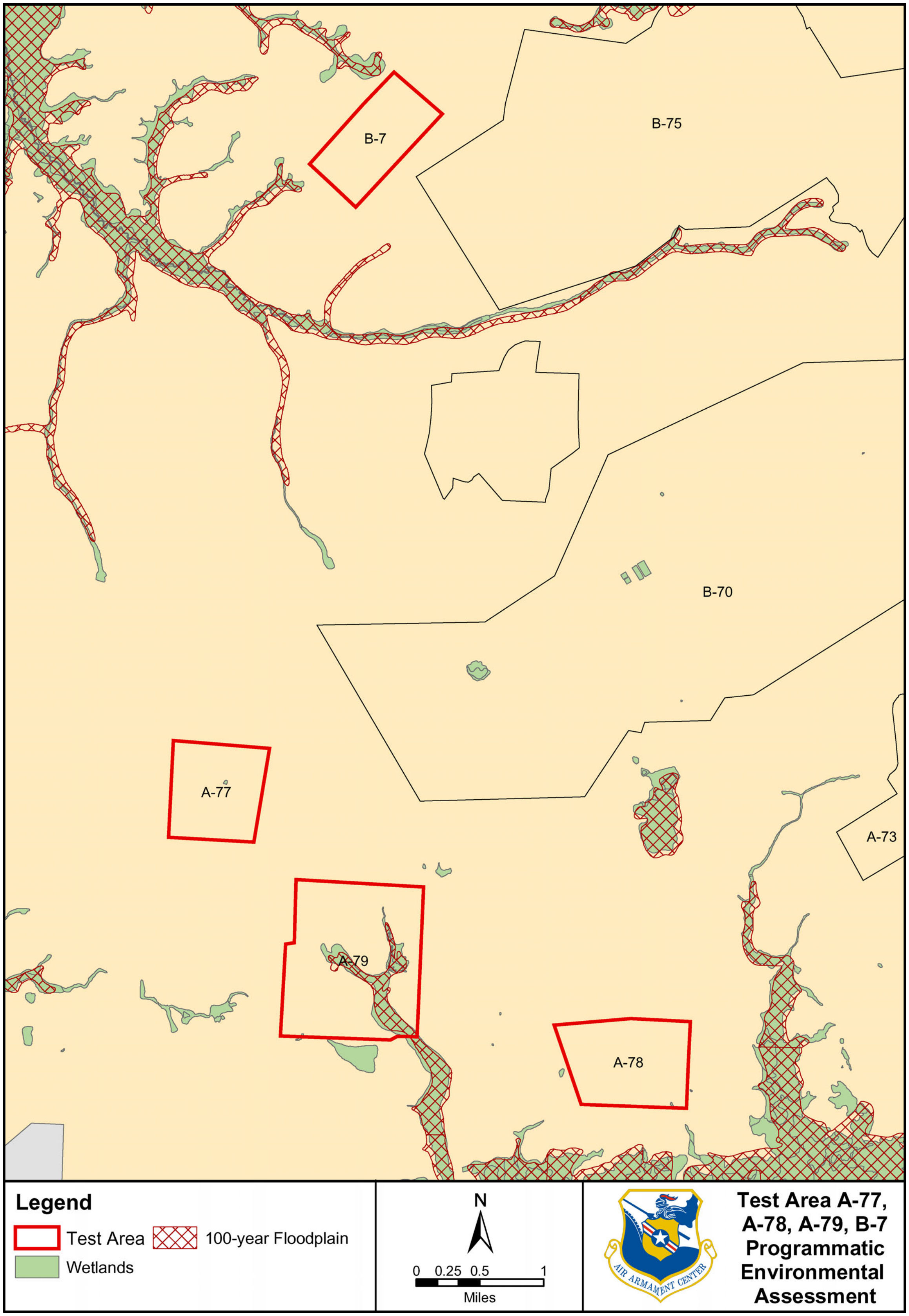

Figure 3-8. Wetlands and Floodplains in the Vicinity of Test Areas A-77, A-78, A-79, and B-7

Floodplains and the Coastal Zone Management Act

Floodplains are lowland areas adjacent to surface water bodies (i.e., lakes, wetlands, and rivers) that are periodically covered by water during flooding events. Floodplains carry and store floodwaters during flood events. Floodplains and riparian habitat are biologically unique and highly diverse ecosystems providing a rich diversity of aquatic and terrestrial species, acting as a functional part of natural systems. Floodplain vegetation and soils act as water filters, intercepting surface water runoff before it reaches lakes, streams, or rivers. This process aids in the removal of excess nutrients, pollutants, and sediments from the water and helps reduce the need for costly cleanups and sediment removal. Floodplains also reduce downstream flooding by increasing upstream storage in wetlands, sloughs, back channels, side channels, and former channels.

Flooding on Eglin AFB could occur as a result of rainfall within the base's drainage basins, hurricanes, or a combination of both. The majority of the installation is above the Federal Emergency Management Agency (FEMA) 100-year flood zone; however, extensive flood-prone areas occur along the Yellow River drainage system and the East Bay Swamp. Most of the perennial streams on base are included within areas expected to be inundated by 100-year floods. The 100-year floodplain is considered a Wetland Resource Area under the Wetlands Protection Act. The only portion of the four TAs that falls within the 100-year floodplain is the area adjacent to Panther Creek, which runs through the center of A-79 (Figures 3-6 and 3-8).

The term *coastal zone* is defined as coastal waters and adjacent shorelands that are strongly influenced by each other and are in proximity to the several coastal states, and including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. *Coastal waters* are defined as any waters adjacent to the shoreline that contain a measurable amount of sea water, including but not limited to sounds, bays, lagoons, bayous, ponds, and estuaries. The outer boundary of the coastal zone is the limit of state waters, which for the Gulf coast of Florida is 9 nautical miles from shore. Since the Proposed Action is to be conducted within Eglin airspace and land ranges, some components of this action would take place within the jurisdictional concerns of FDEP and therefore would require a consistency determination with respect to Florida's Coastal Zone Management Plan and the Coastal Zone Management Act (CZMA).

Any actions being considered by federal agencies must be evaluated to determine whether they would occur within a floodplain (Executive Order (EO) 11988, Floodplain Management). Floodplains that must be considered include those areas with a 1 percent chance of being inundated by floodwater in a given year (also known as a 100-year floodplain).

EO 11988, Floodplain Management (42 Federal Register (FR) 26951, 1977), requires federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid floodplain development whenever possible. Additionally, EO 11988 requires federal agencies to make every effort to reduce the risk of flood loss; minimize the impact of floods on human health, safety, and welfare; and preserve the natural beneficial value of floodplains. The order stipulates that federal agencies proposing

actions in floodplains consider alternative actions to avoid adverse effects, avoid incompatible development in the floodplains, and provide opportunity for early public review of any plans or proposals. If adverse effects are unavoidable, the proponent must include measures in the action to minimize impacts.

Additionally, EO 11990, Protection of Wetlands (42 FR 26961, 1977), places additional requirements on floodplains when they are considered as wetlands, requiring federal agencies to avoid undertaking or providing assistance for new construction located in wetlands unless there are no practicable alternatives and all practicable measures to minimize harm to wetlands have been implemented. It also precludes federal entities from leasing space in wetland areas unless there are no practicable alternatives.

Parts of the floodplain that are also considered wetlands will, in addition to floodplain zonings, receive protection from federal, state, and local wetland laws. These laws, such as the U.S. Army Corps of Engineers (USACE) Section 404 Permit Program, regulate alterations to wetlands to preserve both the amount and integrity of the nation's remaining wetland resources.

The CZMA provides for the effective, beneficial use, protection, and development of the U.S. coastal zone. Federal agency activities in the coastal zone are required to be consistent to the maximum extent practicable with approved state coastal zone management plans. Federal agencies make determinations whether their actions are consistent with approved state plans and submit these determinations for state review and concurrence (Appendix C). All relevant state agencies must review the Proposed Action and issue a consistency determination. The Florida Coastal Management Program (FCMP) is composed of 23 Florida statutes administered by 11 state agencies and four of the five water management districts.

FDEP serves as the lead agency in FCMP matters at Eglin AFB. Information submitted to the state of Florida for consistency review will go through the Florida State Clearinghouse (Clearinghouse), which is located within FDEP. The Clearinghouse will serve as the single point of contact for the various agencies. The information will be routed to all the appropriate state, regional, and local reviewers. Recommendations regarding the activity's consistency are provided by member agencies to FDEP, which makes the state's final consistency determination.

3.4.1 Sensitive Species

Eglin has developed an overall goal within the Integrated Natural Resources Plan to continue to protect and maintain populations of native threatened and endangered plant and animal species within the guidelines of ecosystem management (U.S. Air Force, 2002). In 1992, Eglin, along with USFWS and the Florida Fish and Wildlife Conservation Commission (FWC), entered into a cooperative agreement to manage individual species on the installation, including both federal and state-listed species. Sensitive species include those with federal endangered or threatened status, federal candidate species, and state endangered, threatened, and species of special concern status (U.S. Air Force, 1995). An endangered species is one that is in danger of extinction throughout all or a significant

portion of its range. A threatened species is any species that is likely to become endangered within the future throughout all or a significant portion of its range due to loss of habitat, anthropogenic effects, or other causes. Federal candidate species and state species of concern are those that should be given consideration during planning of projects but have no protection under the ESA.

Air Force projects that may affect federally protected species, species proposed for federal listing, and critical habitat for protected species are subject to Sections 7 and 10 of the ESA prior to the irreversible or irretrievable commitment of these resources (U.S. Air Force, 1995). A Section 7 consultation with USFWS would be required if a take, which is defined as pursuing, molesting, or harming a protected species, were to occur. If the Proposed Action is likely to adversely affect a federally protected species, USFWS would determine whether jeopardy or nonjeopardy to the species population would occur. Table 3-8 exhibits threatened, endangered, and sensitive animal and plant species associated with the TAs. For species descriptions and maps for specific locations of sensitive species, refer to Appendix G.

Table 3-8. Sensitive Species On and Near ATGG Test Areas

Scientific Name	Common Name	Status	Location
Amphibians			
Ambystoma cingulatum	Flatwoods salamander	FT, SSCC, CT	A-77*, A-78*, A-79*
Rana capito sevosa	Dusky gopher frog	SSC	A-78*, A-79*
Rana okaloosae	Florida bog frog	SSC, CT	A-78**, A-79, B-7**
Reptiles			
Alligator mississippiensis	American alligator	FT(S/A), SSC	A-79
Drymarchon corais couperi	Eastern indigo snake	FT, ST	A-78***
Gopherus polyphemus	Gopher tortoise	SSC, CT	A-78*
Macroclemys temmincki	Alligator snapping turtle	SSC	A-79
Pituophis melanoleucus	Florida pine snake	SSC	A-78***
Birds			
Falco sparverius paulus	Southeastern American kestrel	ST	A-77***, A-78***, A-79***, B-7***
Picoides borealis	Red-cockaded Woodpecker	FE, ST, CT	A-77*, A-78*, A-79, B-7*
Mammals			
Ursus americanus floridanus	Florida black bear	ST, CT	A-79
Plants			
Carex baltzellii	Baltzell's edge	ST	B-7*
Calamovilfa curtissii	Curtis' Sandgrass	ST	A-77*, A-79*
Aristida simpliciflora	Southern Threeawn Grass	SE	A-78*
Tephrosia mohrii	Pineland Hoary Pea	ST	A-78*
Baptisia calycosa	Hairy Wild Indigo	ST	A-78*, A-79*

* Within 1- km buffer of test area
FE = Federally endangered
FT = Federally threatened
CT = Eglin/FNAI conservation target
SE = State endangered
ST = State threatened
** Outside test area and 1- km buffer, but downstream of site
*** Potential habitat based on site characteristics, associated species
FT(S/A) = Federally threatened due to similarity of appearance to another species
SSC = State species of special concern
SSCC = State species of special concern candidate

3.5 ANTHROPOGENIC RESOURCES

3.5.1 Cultural Resources

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, and any other physical evidence of human activity considered important to a culture or community for scientific, traditional, religious, or other reasons. Historic properties are cultural resources included in, or eligible for inclusion in, the National Register of Historic Places (National Register) maintained by the National Park Service. The National Register includes artifacts, records, and remains that are related to and located within such properties. As a federal agency, Eglin Air Force Base is required under the National Historic Preservation Act (NHPA) of 1966, as amended, to consider the effects of its undertakings on historic properties listed, or eligible for listing, in the National Register.

Section 106 of the National Historic Preservation Act requires that federal agencies analyze the impacts of federal activities on historic properties. When a federal action meets the definition of an undertaking, the federal agency must consult with the State Historic Preservation Officer (SHPO) and any other identified consulting parties. The Section 106 review begins with the identification of an area of potential effect and an assessment of information needs. In this step, all available information on historic properties is examined to determine the proper course of action. The federal agency is responsible for determining whether any historic properties are located in the area and assessing whether the proposed undertaking will adversely affect the resources. An *adverse effect* is defined as any action that may directly or indirectly alter the characteristics that make the property historic (and thus eligible for listing on the National Register). The federal agency is also responsible for notifying the SHPO and the Advisory Council on Historic Preservation, of any adverse effects. The federal agency then consults with the SHPO to develop measures to avoid, minimize, or mitigate the adverse effects of the federal undertaking. Alternatively, the assessment may result in the need for cultural resources investigations (e.g., historical research, field survey, architectural survey, among others). Section 106 compliance is achieved upon completion of a memorandum of agreement between the agency (Eglin) and the SHPO.

The NHPA also mandates that federal agencies consult with federally recognized Indian tribes to identify, evaluate, and treat historic properties that have religious or cultural importance to those groups. Eglin AFB has completed a study to establish formal government-to-government relationships to federally recognized tribes that have historic ties to the local area.

AAC/EMH is currently integrating their maps into a Geographic Information System (GIS) to better describe definitive areas of cultural resource concern. A map of all of the areas of cultural resource concern on Eglin is in production and upon completion will be placed in the GIS viewer and on the Eglin internal website. More specific information is sensitive and AAC/EMH should be consulted on a need-to-know basis. Until a complete survey of the areas of concern has been accomplished, the danger of direct physical impact to unknown cultural resources is a possibility.

Description of Existing Conditions

This section contains information on known cultural resource sites that are listed, eligible, or potentially eligible for listing on the National Register that could be adversely impacted by the Proposed Action. Test Area A-77 is clear of cultural concerns within the test range; however, unsurveyed high probability areas (HPAs) exist to the immediate east and west of its boundaries. TA A-78 is clear of archaeological concerns with the exception of a very small, unsurveyed high probability area within the boundaries of the range. The third TA, A-79, contains several potentially eligible archaeological sites within the boundaries of the range. These regions include historic homesteads and prehistoric sites. Finally, B-7 is clear of cultural resources except for a small, unsurveyed, high probability area within the range boundaries (Stanley, 2003).

Table 3-9 provides a summary of the known archaeological sites associated with TAs A-77, A-78, A-79, and B-7. Figure 3-9 illustrates the locations of these sites.

Table 3-9. Cultural Resources Sites

Location Test Area:	Site #	Eligibility for NRHP	Comments
A-77	None		Clear of cultural concerns.
A-78	None known		Contains HPA area, needs survey.
A-79	8SR1333	Potentially eligible	Historic homestead.
A-79	8SR1515	Potentially eligible	Harvell or Coleman homestead with evidence of three possible structures.
A-79	8SR1531	Potentially eligible	Harvell or Barlow homestead with brick concentrations – part of the community.
A-79	8SR1541	Potentially eligible	Harvell or Wells homestead, artifact concentrations containing structural remains.
A-79	8SR1562	Potentially eligible	Prehistoric site
A-79	8SR1559	Potentially eligible	Prehistoric site
B-7	None known		Contains HPA, needs survey.

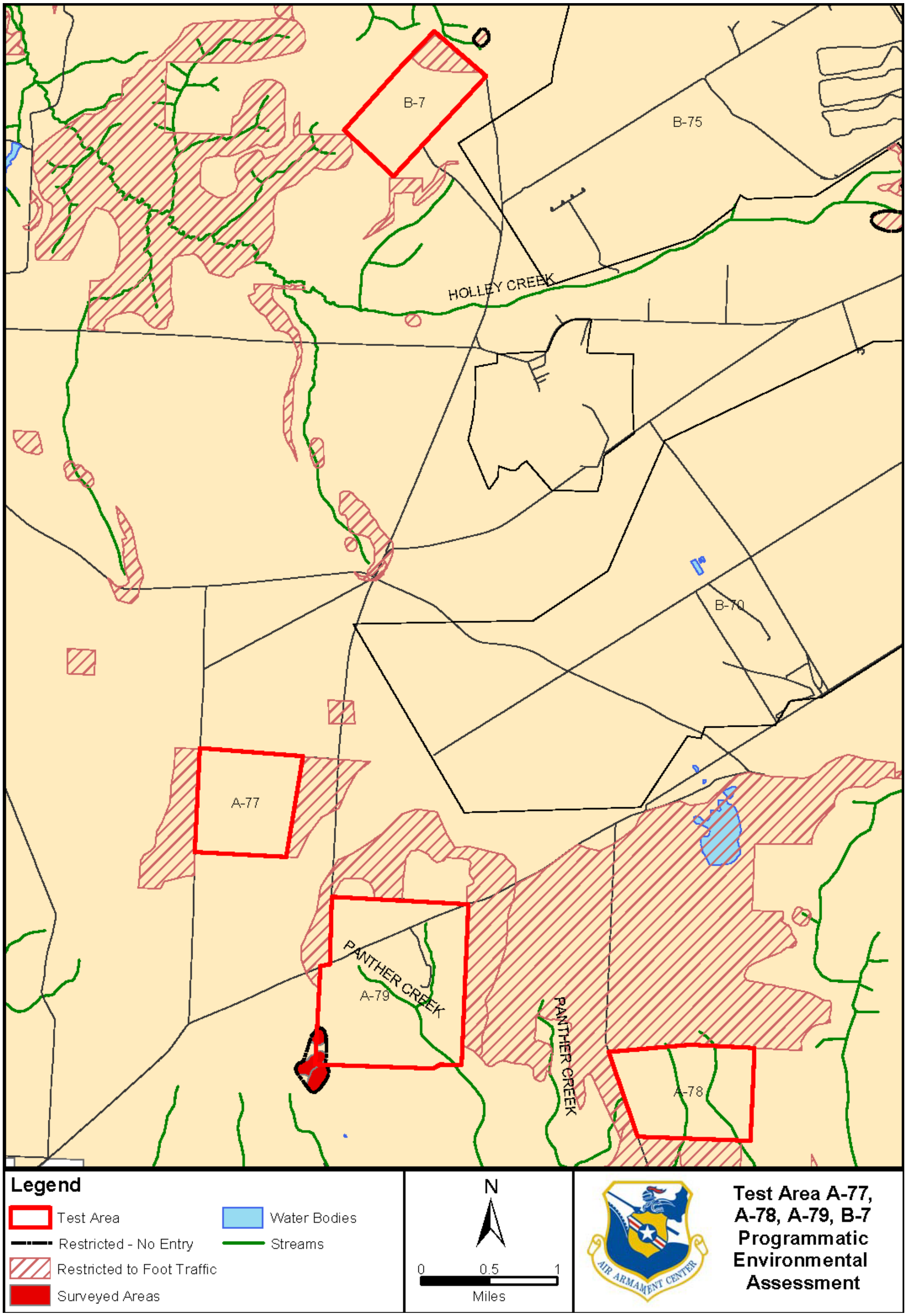

Figure 3-9. Test Areas A-77, A-78, A-79, and B-7 Cultural Resources

3.5.2 Socioeconomics

Noise

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with military training and the conduct of military training exercises. Concerns regarding noise relate to certain potential impacts such as hearing loss, nonauditory health effects, annoyance, speech interference, sleep interference, and effects on domestic animals, wildlife, structures, terrain, and historic and archaeological sites.

This environmental assessment considers noise associated with the use of live ordnance at TAs A-77, A-78, A-79, and B-7. Exercises using these training areas include aircraft operations, ground operations, and the use of various types of high explosives.

Based on numerous sociological surveys and recommendations of federal interagency councils, the most common benchmarks for assessing environmental noise impacts are a day-night average sound level of 65 dBA for A-weighted noise (65 L_{dn}), and 62 dBC for C-weighted noise (62 L_{Cdn}). Noise resulting from most transportation and other daily human-related activity is measured on the A-weighted scale. Impulsive noise, such as that resulting from gunfire or explosions is measured on the C-weighted scale. These noise level thresholds are often used to determine residential land use compatibility and risk of human annoyance. In general, when exposed to noise below the levels identified above, land uses are unrestricted. As noise levels increase above these levels, some land uses become incompatible. Several other noise levels are also useful in assessing environmental impacts.

- A day-night average noise level of 55 dBA was identified by USEPA as a level "... requisite to protect the public health and welfare with an adequate margin of safety" (USEPA, 1974). Noise may be heard, but there is no risk to public health or welfare.
- A day-night average noise level of 75 dBA is a threshold above which effects other than annoyance may occur. It is 10 to 15 dBA below levels at which hearing damage is a known risk (OSHA, 1983). However, it is also a level above which some adverse health effects cannot be categorically discounted.
- A sound pressure level (SPL) of 140 dBP has been identified by the U.S. Department of Labor, OSHA as a maximum recommended unprotected exposure level necessary to prevent physiological damage to the human ear drum (29 Code of Federal Regulations (CFR) Ch. XVII § 1926.52(e)).
- A SPL less than 115 dBP has been shown to cause minimal public annoyance resulting from the noise (Russell, 2001).

Public annoyance is often the most common impact associated with exposure to elevated noise levels. When subjected to day-night average sound levels of 65 dBA or 62 dBC, approximately 12 to 15 percent of persons so exposed will be "highly annoyed" by the noise. At levels below 55 dBA or 52 dBC, the percentage of annoyance is correspondingly lower (approximately 3 percent or less). The percentage of people annoyed by noise never drops to zero (some people

are always annoyed), but at lower levels it is reduced enough to be essentially negligible (Finegold et al., 1994; CHABA, 1981).

Time-Averaged Cumulative Day-Night Average Noise Metrics

The equivalent sound level (L_{eq}) is a metric reflecting average continuous sound. The metric considers variations in sound magnitude over periods of time, sums them, and reflects, in a single value, the acoustic energy present during the time period considered. Common time periods for averaging are 1-, 8-, and 24-hour periods.

The day-night average sound level (L_{dn}) also sums the individual noise events and averages the resulting level over a specified length of time. Normally, this is a 24-hour period. Thus, like L_{eq}, it is a composite metric representing the maximum noise levels, the duration of the events, and the number of events that occur. However, this metric also considers the time of day during which noise events occur. This metric adds 10 decibels (dB) to those events that occur between 2200 and 0700 hours (10:00 P.M. and 7:00 A.M.) to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime. It should be noted that if no noise events occur between 10:00 P.M. and 7:00 A.M., the value calculated for L_{dn} would be identical to that calculated for a 24-hour equivalent noise level ($L_{eq(24)}$). This cumulative metric does not represent the variations in the sound level heard. Nevertheless, it does provide an excellent measure for comparing environmental noise exposures when there are multiple noise events to be considered.

Existing Conditions

In the project region, ambient noise (the surrounding background noise) currently exists as a result of transportation-related and other human activities. Many types of civil and military aircraft operate throughout the region and also make use of the military training airspace overlying the area. Vehicles on roads are also sources of noise. Military units currently conduct a wide range of training activities on and in the immediate vicinity of Eglin AFB. This includes ground-based operations and testing and training for military pilots in designated military training airspace.

Aircraft Noise

Noise from Eglin aircraft operations was modeled by airspace block using the program MR_NMAP and expressed as L_{dn} (U.S. Air Force, 1996). Average A-weighted day-night noise levels range from 50-55 within the R2915A airspace overlying TAs A-77, A-78, A-79, and B-7.

Testing and Training Noise

Testing and training noise make up a significant portion of the affected environment at the subject TAs. Small arms fire, gunnery noise, and live detonations are common contributors to the existing noise environment.

3.5.3 Environmental Justice and Child Safety

Concern that minority populations and/or low-income populations bear a disproportionate amount of adverse health and environmental effects led to the issuance of EO 12898 in 1994. EO 12898, Environmental Justice (EJ), and the accompanying memorandum ensure that federal agencies focus attention on:

> The environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities, and low-income communities, when such analysis is required by NEPA 42 USC section 4321 *et seq*.

USEPA responded by developing the Environmental Justice Strategy that focuses on the agency's efforts in addressing these concerns. The U.S. Air Force published additional guidance called *The Interim Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP)* (U.S. Air Force, 1997). This guide contains a general approach for conducting EJ analysis in conjunction with Air Force Instruction (AFI) 32-7061 (EIAP). This is the first step in conducting an EJ assessment for Eglin AFB. Additionally, the USEPA Region 4 office has a set of EJ guidelines to follow. This region has a methodology that analyzes demographic data for the affected communities that assists in analyzing the adverse environmental impacts for minority and low-income populations.

Executive Order 13045 mandates that all federal agencies assign a high priority to addressing health and safety risks to children, coordinating research priorities on children's health, and ensuring that their standards take into account special risks to children.

This EJ requirement involves a calculation of potential minority and low-income areas for the Eglin Region of Influence (ROI) using the best credible data. The demographic profile of the region in which the project area is located provides the context within which the EJ is conducted.

Table 3-10 lists the percentage of minority and low-income populations against the community of comparison (COC) results. The COC values represent the percentages of minority and low-income populations within a geographic extent representing the ROI. Areas where the area of concern (AOC) percentages are greater than the COC percentages are identified as having potential EJ concerns. Typically, countywide percentages have been used for the area of concern and statewide percentages for the community of comparison. The ROI includes all Florida counties from Escambia east to Taylor, and Coffee, Covington, Crenshaw, and Geneva counties in Alabama. As all activities described in this assessment occur on the western aspect of the reservation, adjacent to Santa Rosa County, the single county COC percentages are important to this analysis.

Table 3-10. Minority/Low Income Comparisons with COC (2000 Census)

	Minority %	Exceeds COC %	Low-Income %	Exceeds COC %
Eglin AFB ROI	25.48	No	14.97	No
Santa Rosa County	10.89	Yes	9.83	Yes

A more specific method of evaluating EJ concerns is by looking at specific socioeconomic conditions of Eglin's surrounding communities. This targeted approach follows the general guidelines presented in *The Interim Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP)* (U.S. Air Force, 1997). This targeted approach was performed using aerial photographs of impacted residential areas; Chapter 4 discusses results.

GIS mapping was used to conduct targeted analyses. The AOC consisted of each individual block (minority) or block group (low-income) within the counties that are adjacent to Eglin AFB. The COC consisted of the overall percent minority and percent low-income of the combined four counties. The resulting data was divided into four distinct categories: areas with no EJ concerns, areas with minority concerns, areas with low-income concerns, and areas with both minority and low-income concerns. Additionally, water bodies and census blocks with zero population were filtered out and identified as areas with no EJ concerns. The results are mapped in Figure 3-10. This map indicates that there are potential EJ concern areas in and adjacent to the Eglin reservation.

3.5.4 Installation Restoration Program

The IRP sites and associated test areas found on or near TAs A-77, A-78, A-79, and B-7 are shown previously in Figure 3-5. For specific information on the IRP sites, refer to Appendix H.

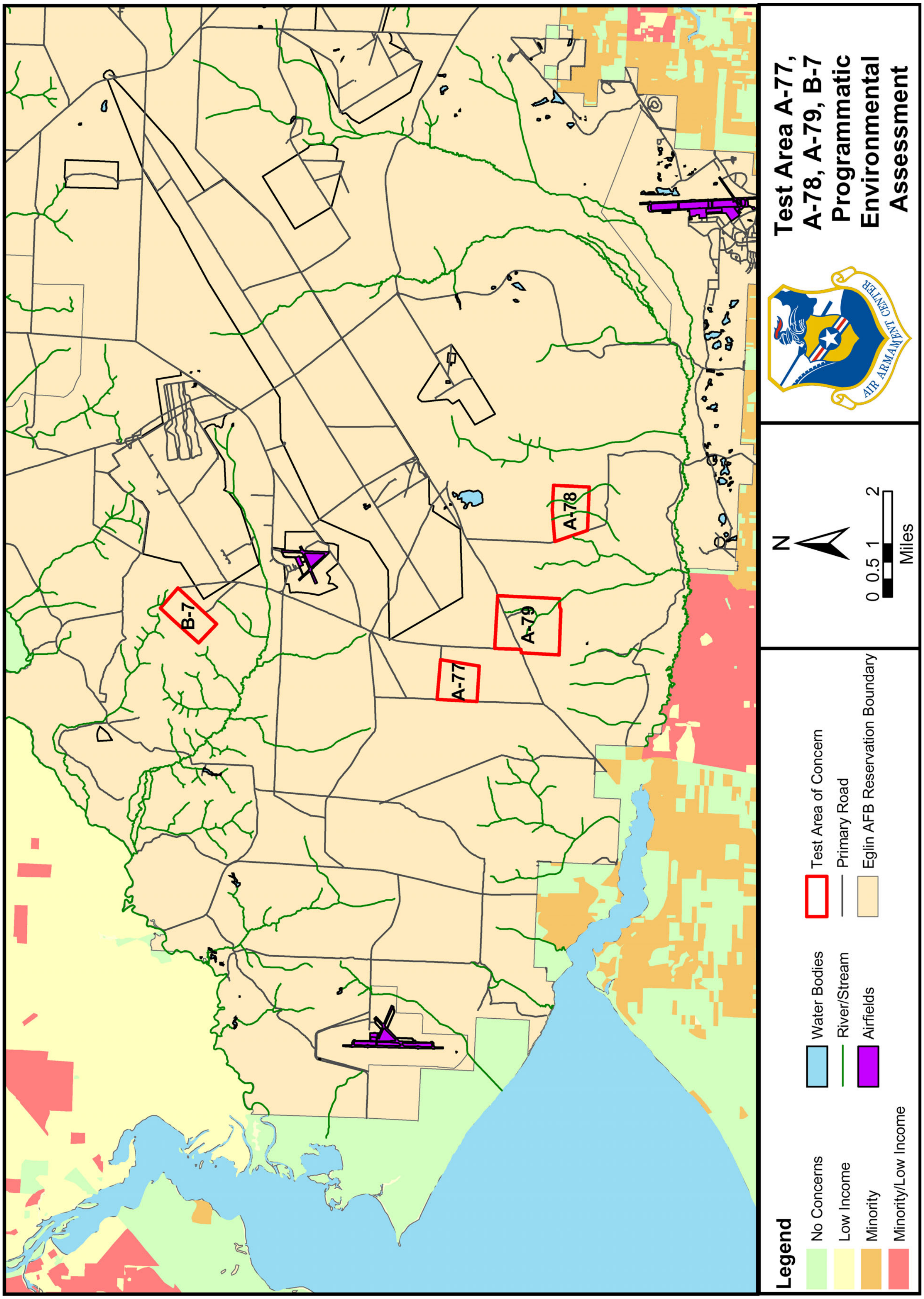

Figure 3-10. Areas of Concern for Environmental Justice

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4. ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes the potential impacts of implementing the action alternatives and range sustainability Best Management Practices (BMPs) (Chapter 2) on the affected environment of Test Areas (TAs) A-77, A-78, A-79, and B-7 (Chapter 3). Analysis will focus on quantifying potential environmental impacts to the physical (air, water, and soil), biological (plants and wildlife), and cultural resources of TAs A-77, A-78, A-79, and B-7. This section will identify environmental issues and impacts associated with the alternatives, which recommend BMPs and propose increases in mission activities on the TAs. Analysis focuses on these BMPs and mission activities and the potential impacts to resources in the Region of Influence (ROI) of each TA's mission activities. The organization of this chapter and the environmental analysis process utilized is described below.

4.1.1 Organization

Identified Resources

The affected environment (Chapter 3) resources have been summarized into three general resource categories for impact analyses.

- Physical Resources
  - Air Quality
  - Soil Quality
  - Water Quality
- Biological Resources
  - Sensitive Species
  - Sensitive Habitats
- Anthropogenic (Human-Related) Resources
  - Public
  - Cultural

Issues

An environmental consequence issue is a general category of common mission products, by-products, and/or emissions (pollutants) that may be collectively analyzed for potential impacts to the affected environment. Seven broad categories of potential environmental consequence issues have been identified for the study area.

- Noise (Section 4.2)
- Restricted Access/Safety (Section 4.3)

- Debris (Section 4.4)
- Habitat Alteration (Section 4.5)
- Direct Physical Impacts (Section 4.6)
- Chemical Materials (Section 4.7)
- Air Quality (Section 4.8)

4.1.2 Process

Environmental Analysis

Each military activity category was associated with potential issues related to the activity. Then, for each issue category, the receptors that were potentially impacted by each issue were identified and environmental analyses were performed. The mission activities, associated issues, and potentially impacted receptors pertaining to TAs A-77, A-78, A-79, and B-7 are listed in Table 4-1.

Table 4-1. Mission Activities, Associated Issues, and Potentially Impacted Receptors for Test Areas A-77, A-78, A-79, and B-7

Mission Activity	Receptor	Issue						
		Noise	Restricted Access/Safety	Debris	Habitat Alteration	Direct Physical Impact (DPI)	Chemical Materials	Air Quality
Alt. 1	Physical	-	-	-	-	-	⊗	-
	Biological	⊗	-	-	⊗	-	⊗	-
	Anthropogenic	-	⊗	⊗	-	-	⊗	-
Alt. 2	Physical	-	-	-	-	-	⊗	-
	Biological	⊗	-	-	⊗	-	⊗	-
	Anthropogenic	-	⊗	⊗	-	-	⊗	-
Alt. 3	Physical	-	-	-	-	-	⊗	-
	Biological	⊗	-	-	⊗	-	⊗	-
	Anthropogenic	-	⊗	⊗	-	-	⊗	-
Alt. 4	Physical	-	-	-	-	-	⊗	-
	Biological	⊗	-	-	⊗	-	⊗	-
	Anthropogenic	-	⊗	⊗	-	-	⊗	-

- No potential impact
⊗ Potential impact

The analysis of mission activities and their potential effects on resources associated with TAs A-77, A-78, A-79, and B-7 produces a measure for each prescribed issue, which can be used for comparison when considering alternatives. Data from the baseline, plus selected historical activities, are used for environmental analysis. For the environmental analysis of TAs A-77, A-78, A-79, and B-7, a scenario method of analysis was utilized based on these historical mission activities, with the alternatives identifying the types and levels of activities.

Mission activity scenarios were developed to establish a measurement of impacts. Assumptions, based on a combination of established scientific methodologies and professional judgments, were

then formulated to reflect the behavior, condition, and/or interactions of mission activities and environmental factors. Mission impacts to environmental factors were then measured based on a comparison to available threshold criteria presented in environmental regulations and scientific literature in order to exhibit the extent of impacts. In some cases, criteria for evaluating potential impacts were unavailable. In such cases, the discussion was based on what is known in the literature about impacts related to the issue.

4.2 NOISE

Noise from Air to Ground Gunnery (ATGG) operations may potentially affect people living off of the reservation or sensitive species that occur on the reservation. Several types of noise are produced from ATGG operations: aircraft noise, ground-based mission noise, and airborne gunnery noise. Aircraft noise is described as a continuous noise, whereas gunnery noise and detonations may be single or repetitive impulse noise events. Different criteria and thresholds are applied to each. Ground-based mission noise is produced by ground operations, which include live small arms fire, the detonation of explosive munitions or charges, and the impact of gunnery rounds at ground targets. Airborne gunnery noise is produced from the propellant blast of gunnery munitions fired at altitude.

Noise analysis in this section addresses potential impacts from air-to-ground gunnery operations to the surrounding community and to sensitive species.

4.2.1 Alternative 1 (No Action Alternative)

Noise Impacts on the Surrounding Community

Aircraft Noise

Aircraft noise was previously analyzed in the Eglin AFB Overland Air Operations Programmatic Environmental Assessment (PEA) (U.S. Air Force, 1998), which is the basis for the following discussion on aircraft noise associated with TAs A-77, A-78, A-79 and B-7 and the airspace blocks R-2915A and R-2915B.

Training activities involving firing of aircraft guns occur routinely on the subject TAs as part of Special Operations activities, and most of these missions occur at night but not generally later than 2300 hours. Typical of the aircraft most commonly flying low and slow in these areas include the C-130 fixed wing aircraft and the CH-53 helicopter. The Lockheed C-130 Hercules is a four-engine turboprop transport, built in a variety of versions including the AC-130 gunship, the MC-130 Combat Talon transport, and the HC-130 Combat Shadow tanker. The CH-53 is a Sikorsky-built twin-engine heavy assault transport helicopter. Effective perceived noise levels (EPNLs), maximum A-weighted noise levels (ALMs), and sound exposure levels (SELs) associated with C-130 Model A&D fixed-wing aircraft were developed using NOISEMAP as described in the Overland Air Operations Environmental Baseline Document (Table 4-2) (U.S. Air Force, 1997).

The projected noise from aircraft involved in ATGG missions on Test Areas A-77, A-78, A-79, and B-7 was calculated. Table 4-2 depicts the amount of noise associated with the C-130 and CH-53 ME on these test areas.

Table 4-2. Air-to-Ground Noise Associated With Aircraft at Cruise Power

Aircraft	Altitude	EPNL	ALM	SSL
C-130	500 feet	98.2	88.9	93.2
CH-53 ME	200 feet	105.4	99.0	102.5

Source: U.S. Air Force, 1997a

The Overland Air Operations Final Programmatic Environmental Assessment (U.S. Air Force, 1998) analyzed subsonic aircraft noise throughout the land ranges of Eglin. The report concluded that all airspace surrounding the military complex, including airspace parcel R-2915A that encompasses TAs A-77, A-78, A-79, and B-7, is utilized well below the threshold established for public noise disturbance, and no impacts to wildlife were identified. Specifically, the report shows that the number of sorties flown in range R-2915A could be increased by approximately 600 percent without generating unacceptable noise levels off base.

Although FY95 Average Day/Night Sound Levels noise levels from subsonic flight were determined to be below the threshold for residential impact, noise complaints on aircraft noise were reported. During FY95, Eglin received a total of 44 noise complaints from low-flying aircraft, helicopters, or general aircraft noise. However, considering that the number of sorties flown in FY95 was 17,604, only 0.2 percent of sorties flown generated noise complaints (assuming that each noise complaint correlated to one sortie).

Average Noise from Ground-Based Missions

Analysis

Noise impacts are normally assessed as those occurring during a “typical exercise-day” averaged from a year’s events. This results in a conservative assessment but also minimizes either overstating or understating noise impacts. In the case of the use of the four TAs, ordnance expenditures occur during both air and ground operations. At TAs A-77 and A-78, the number of air operations significantly exceeded the number of ground operations. At A-79, only ground operations occurred (with one exception), and at B-7, only air operations occurred.

In order to standardize the assessments and make them congruent, several assumptions were made. For each of the four areas, these assumptions were:

- The numbers of air and/or ground operations over a four-year period were averaged to determine an “average year’s operations” activity.
- Specific types of ordnance expenditures were allocated to air or ground operations, whichever seemed most applicable. For example, noise levels associated with the detonation of the warheads of 105-mm howitzer rounds were allocated to air operations, since it was assumed the rounds were delivered by an AC-130 gunship, while noise levels associated with small arms fire were allocated to ground operations.

- Annual averages of ordnance expenditures, by type, were uniformly allocated to annual averages of applicable operations. This provided an average expenditure level per year per operation type, as well as an average expenditure per exercise during each of the four years.
- Noise levels associated with the firing of ordnance from an airborne platform were not considered. There were two reasons for this assumption. First, no reliable model for assessing such noise is known to exist. Noise (the sound pressure waves) resulting from the firing of ordnance from a tube, or gun (muzzle blast), is directionally focused. When an airborne platform is considered, the infinitely-variable gun barrel displacement angle (which imparts directionality to the sound waves), the aircraft-related speed and air turbulence, and the winds between the aircraft and the ground all influence propagation of the resultant sound waves. Combined, these factors make such modeling infinitely complex. Second, however, it must be noted that the muzzle blast occurs at a relatively significant distance from the ground. Although the gun's muzzle blast may be heard by a receptor on the ground, in calculating noise levels, louder sounds dominate the acoustic environment. The attenuated noise from the muzzle blasts that ultimately reaches the ground would be expected to have relative little or no effect on the calculated noise levels of the overall exercise.
- If an exercise occurs between the hours of 10:00 PM and 7:00 AM, a 10-dB penalty is added to each event's individual noise level to account for the added intrusiveness of the noise during the night when normal ambient noise levels are lower than during the day. Based on available data, it was assumed that approximately 5 percent of the events in TAs A-77, A-78, and B-7 occurred at night. No night exercises were reported for A-79.

For the assessment of each of the areas, based on the assumptions above, average noise levels of events were allocated and assessed for a 24-hour period. This provides an average assessment of the noise exposure that would result on the day the exercise was conducted. Results are shown in C-weighted day-night average noise levels (L_{Cdn}). While it is recognized that each exercise is temporary and transient, this method of assessment does reflect the public's noise exposure (if applicable) to exercise noise on the specific day of the exercise.

The first step in the analysis was to calculate the total acoustic energy that would be generated in the exercise area. Next, the detonations of all of the exercise's components were spatially distributed throughout the area considering "most likely" areas of detonation or impact. This yielded a spatially weighted contribution to total area acoustic energy at different points. With this spatial distribution scaled on axes bisecting the area, it was then possible to calculate a mean and standard deviation for the distribution of overall acoustic energy along each axis.

These data were then used to calculate a standard normal distribution and "allocate" acoustic energy to points along each axis. Finally, the normally distributed acoustic energy from multiple source points throughout the site was aggregated at specific points at given distances from the site edges. For these analyses, the exercise "area" evaluated was considered a square, so distances from all site edges are identical. The aggregated noise levels at the receptor points represent the distributed noise that had emanated off the exercise area.

Table 4-3 reflects aggregated noise levels at a range of distances from TA A-77. Listed are the calculated noise levels for a daily exercise and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-3. Average Ground-Based Noise From Test Area A-77 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1.15	68.5	68.0
2.30	63.6	63.1
2.65	Not calculated	**61.9**
2.88	**61.9**	Not calculated

Table 4-4 reflects aggregated noise levels at a range of distances from TA A-78. Shown are the calculated noise levels for a daily exercise and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-4. Average Ground-Based Noise From Test Area A-78 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1.15	68.4	67.4
2.30	63.5	62.5
2.49	Not calculated	**61.9**
2.88	**61.8**	Not calculated

Table 4-5 reflects aggregated noise levels at a range of distances from TA A-79. Shown are the calculated noise levels for a daily exercise and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}. TA A-79 is the least used (<one mission/month) of the subject TAs, but the daily average noise shown in Table 4-5 indicates that on mission days, noise from this TA creates a daily L_{Cdn} value of 62 that extends out to about 4.4 miles. This is due to the amount of explosive used per mission, rather than the number of missions.

Table 4-5. Average Ground-Based Noise From Test Area A-79 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
0.58	Not calculated	**< 62.0**
1.15	71.4	55.8
2.30	66.8	51.2
3.45	63.9	48.3
4.37	**62.0**	Not calculated

Table 4-6 reflects aggregated noise levels at a range of distances from TA B-7. Shown are the calculated noise levels for a daily exercise and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-6. Average Ground-Based Noise From Test Area B-7 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1.15	68.8	66.6
2.07	Not calculated	**61.6**
2.30	63.1	60.9
2.65	**61.8**	Not calculated

Of the four TAs, A-79 has the lowest yearly average noise but the highest daily average noise, explainable in that on a yearly basis this TA is used infrequently (less than 20 days per year) but

on those days missions at TA A-79 involve high net explosive weight detonations, generating noise that can be heard off of the reservation. Since the noise that extends off of the reservation is of a level estimated to highly annoy 12 to 15 percent of the population, and thus generate complaints, some measures to alleviate this are warranted. Often, advance notification of a noisy exercise is sufficient to reduce annoyance, based on the simple logic that awareness will reduce the startle factor associated with loud detonations. Thus, it is recommended to notify the public prior to conducting clay pit demolition training or other bomb detonation activities on A-79. More analysis on impulse noise from detonations is provided in the following section.

Impulse Noise From Detonations

During the baseline period the majority of detonations that occurred on the subject test areas were from gunnery training at A-77, A-78, and B-7, and demolition training at A-79. Recently, the use of heavier ordnance has been employed by the U.S. Marine Corps and U.S. Navy at Eglin, including training events on Test Area A-77. These munitions include bombs heavier than 500 pounds. The impacts from Mk-80 series bombs have been analyzed under the *Navy Pre-Deployment Training at Eglin Air Force Base, Florida, Final Environmental Assessment* (U.S. Air Force, 2004) for various test areas, including TA A-77. Management requirements and consultations were also addressed in the document. Therefore, referral is made to the document and impacts need not be addressed again within this PEA.

To analyze the noise produced from an explosion equivalent to 236 lbs of TNT, the Noise Assessment and Prediction System (NAPS) model was employed. The model was applied using the favorable (no or low winds, no temperature inversions) and unfavorable (strong winds from the north, cool temperatures, temperature inversions present) meteorological conditions illustrated in Figures 4-1 and 4-2. The Eglin Safety Office observes a general restriction of a maximum of 4140-dBP noise level leaving the Eglin Reservation boundary, and this requirement was met for all detonations during the baseline period.

Maximum gunnery round net explosive weight is 7.1 lbs for the 105 mm. Demolition training involved detonations of up to 40 lbs of C-4 high explosive (HE). The largest single detonations occurred on TA A-79 when four Mk-82s were detonated in Johnson Pond as part of a one-time mine countermeasures test that occurred in 1998. Mk-82s have a net explosive weight of 192 lbs, which is equivalent to 236 lbs of TNT.

A minimum of about 800 acres of urban and built-up area would be exposed to 115 dBP as a result of Mk-82 detonations on TA A-79 under favorable weather conditions of no winds and no temperature inversions (Table 4-7, Figure 4-3). This level would likely generate some noise complaints, annoying an estimated 15 percent of the population. Certain weather conditions would potentially increase the degree of noise leaving the reservation and thus the number of noise of complaints.

Under a worse-case scenario of strong winds from the north and several temperature inversions, NAPS modeling indicates that for Mk-82 detonations on TA A-79, noise of up to 130 dBP could leave the reservation (not shown). Window vibration and the onset of window breakage occurs around 127 dBP.

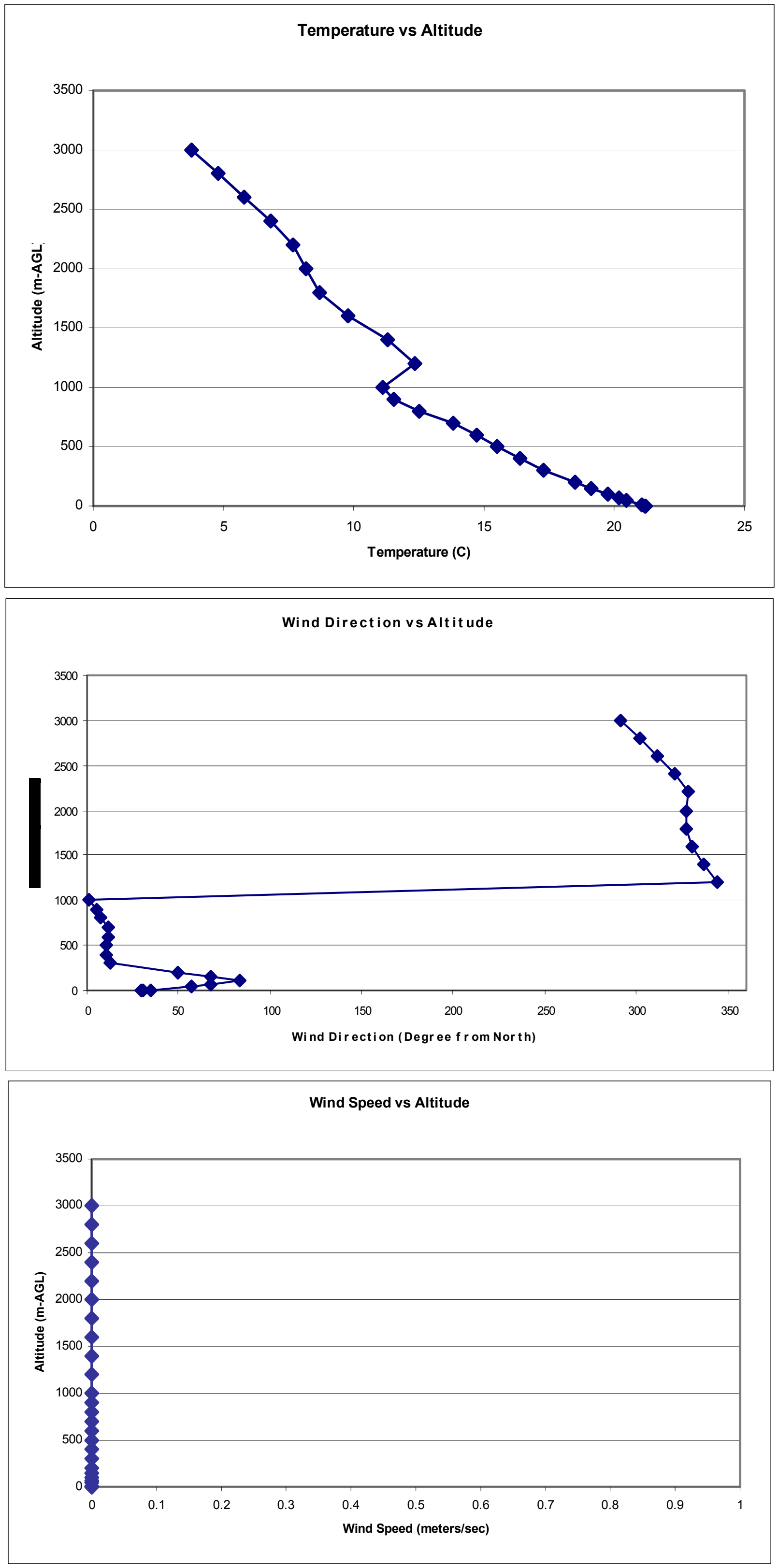

Figure 4-1. Favorable Weather Data Input Into the NAPS Model

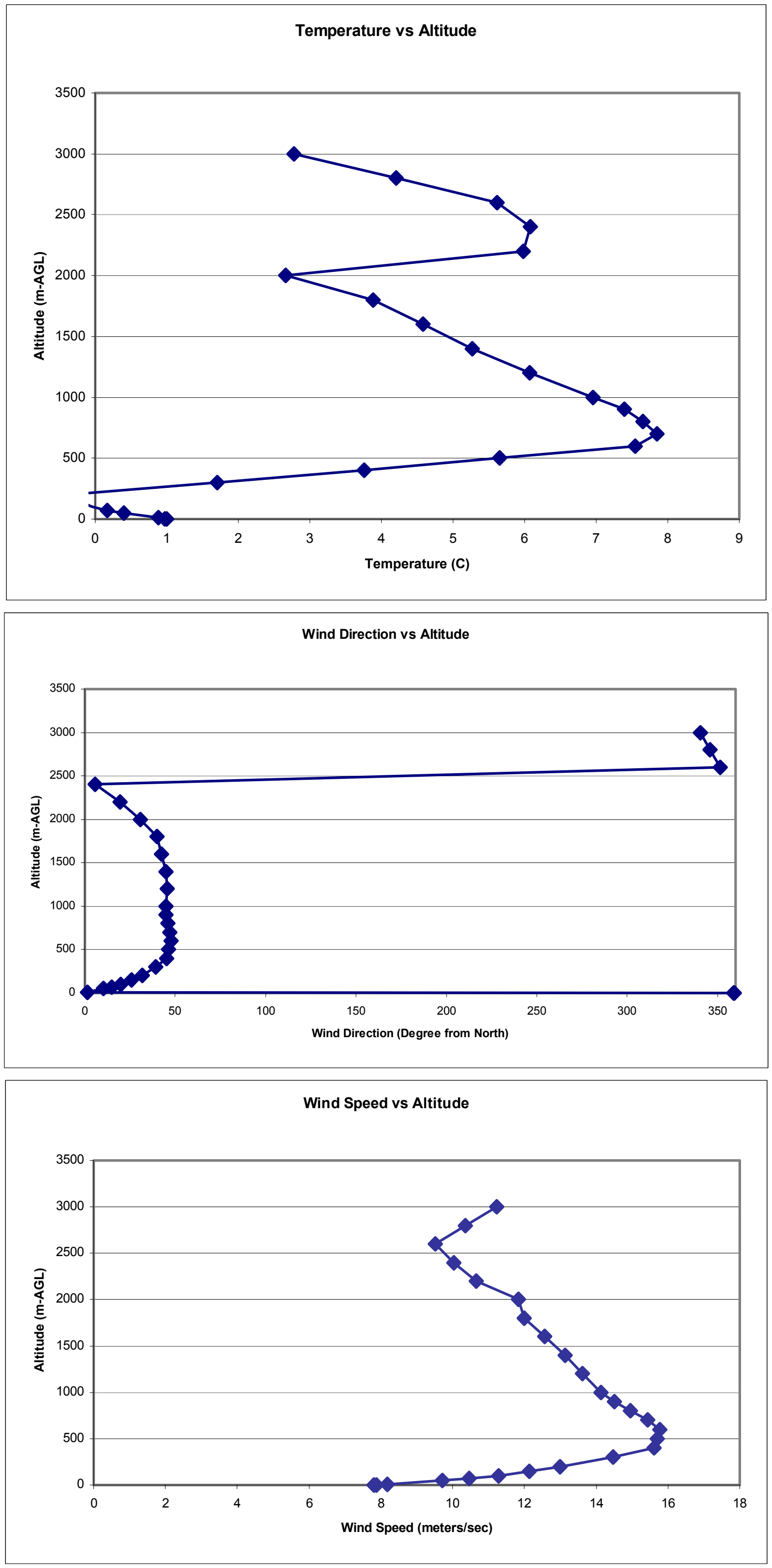

Figure 4-2. Unfavorable Weather Data Input Into the NAPS Model

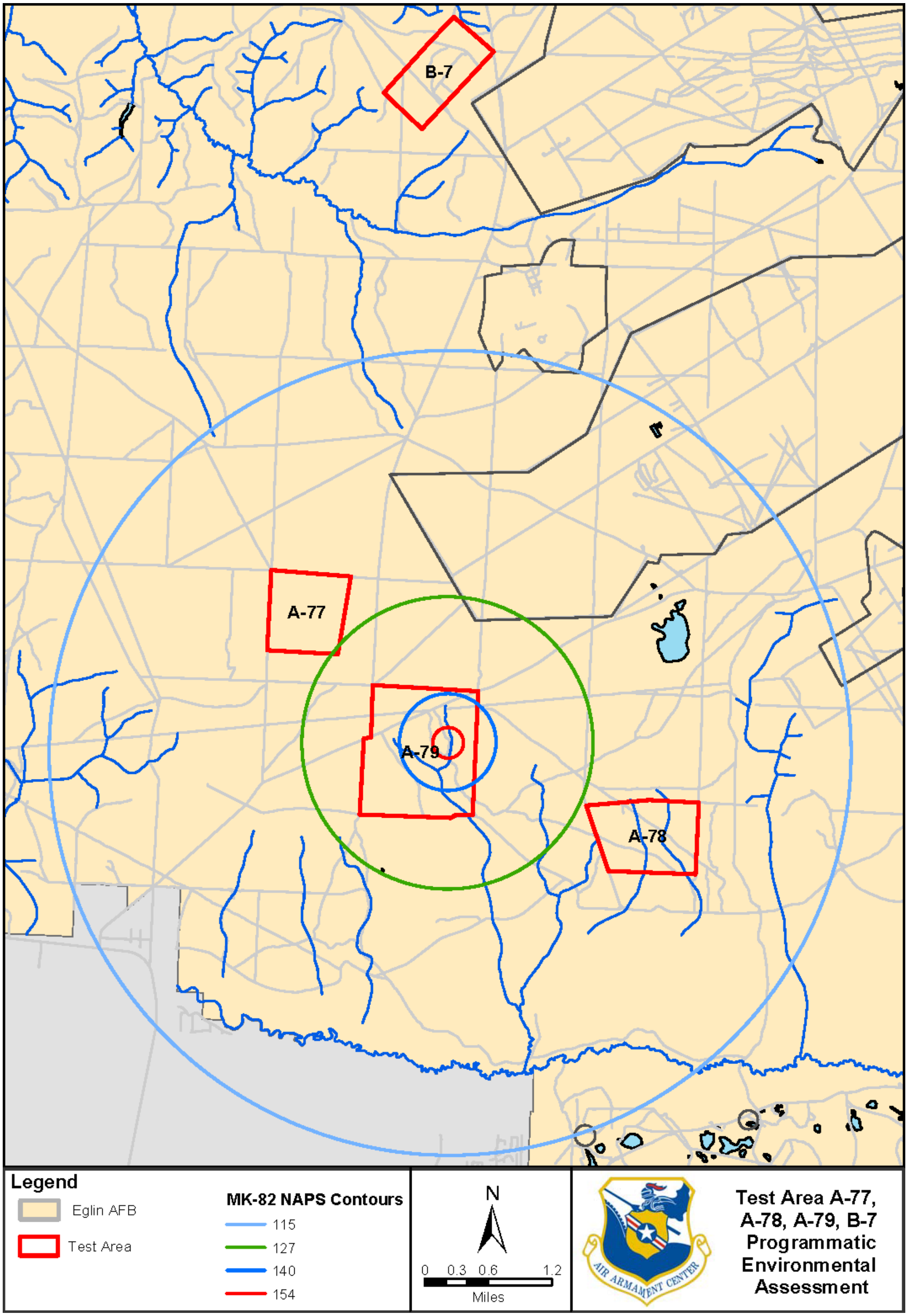

Figure 4-3. Mk-82 Noise Contours Modeled Under Favorable Weather Conditions

Table 4-7. Noise Impact Zones of Mk-82 Charge Under Favorable Weather Conditions

	115 dBP	140 dBP
Impact (feet)	19,890	1,495
Impact area (acres)	28,530	161
Urban and built-up areas exposed (acres)	800	0
Churches and hospitals exposed	0	0

Advance notification of such tests would likely reduce annoyance. Day-of or real-time modeling is suggested for high net explosive detonations in order to predict public noise exposure and, if necessary, postpone tests with a high likelihood of generating widespread adverse public reaction. No sensitive noise receptors, such as schools or hospitals would be exposed under optimum weather conditions of no winds and no temperature inversions.

The Red Horse squadron conducts demolition testing/training in a reconditioned clay borrow pit located in the northwest portion of TA A-79. The maximum noise impact is expected to be associated with detonation of shaped charges containing 40 lbs NEW of C4 HE, because this ordnance type has the highest NEW of any ordnance detonated by the Red Horse squadron in the period 1998 to 2001. During this period, the 40-lb shaped charge was detonated 60 times.

The NAPS model was also applied to evaluate the noise consequences of Red Horse training activities at TA A-79. Effects of terrain in the vicinity of the detonation were not evaluated and the detonation was assumed to occur on a flat land surface. In fact detonations occur in a pit, which would tend to direct the sound waves upward. Consequently, the model results are expected to overestimate actual consequences.

NAPS model results indicate that, under favorable weather conditions, noise levels exceeding 115 dBP would be confined to Eglin AFB and would not affect any civilian populations (see Figures 4-4 and 4-5). Under unfavorable weather conditions, noise levels may exceed 115 dBP up to 30 km in the northeastern and southeastern quadrants radiating from TA A-79 and up to 15 km towards the west (depending on wind directions; maximum impacts were to the northeast under one of the two unfavorable conditions evaluated but to the west-northwest under the alternative unfavorable condition simulated). Consequently, the footprint of areas exceeding 115 dBP could include Fort Walton Beach and Eglin Village to the east, Navarre to the south, Holley and East Bay to the west, and Holt and Galliver to the east-northeast. Figure 4-6 illustrates the noise impacts if detonations took place during unfavorable weather conditions

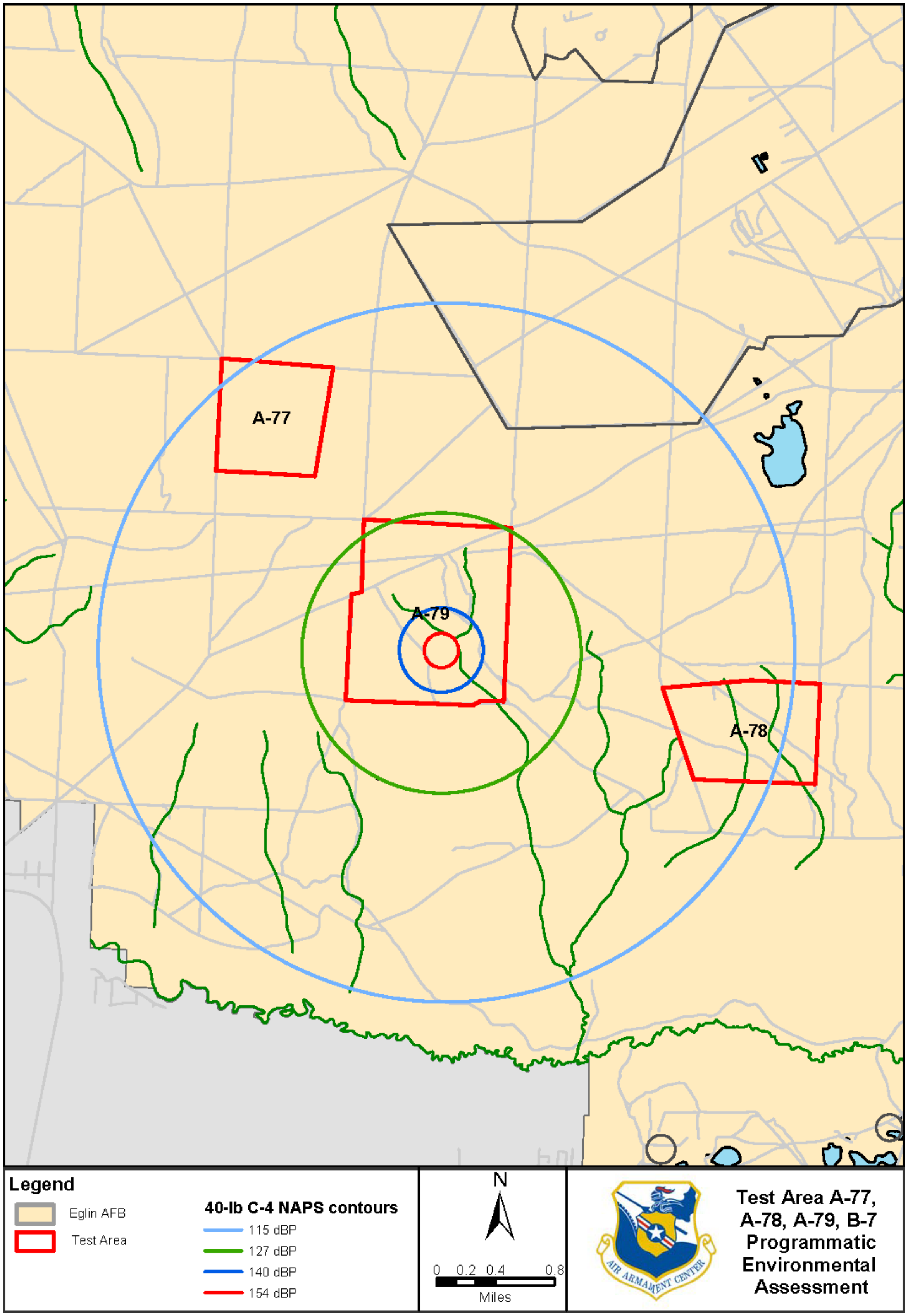

Figure 4-4. Noise From 40-lb C-4 Detonations Modeled Under Favorable Weather Conditions

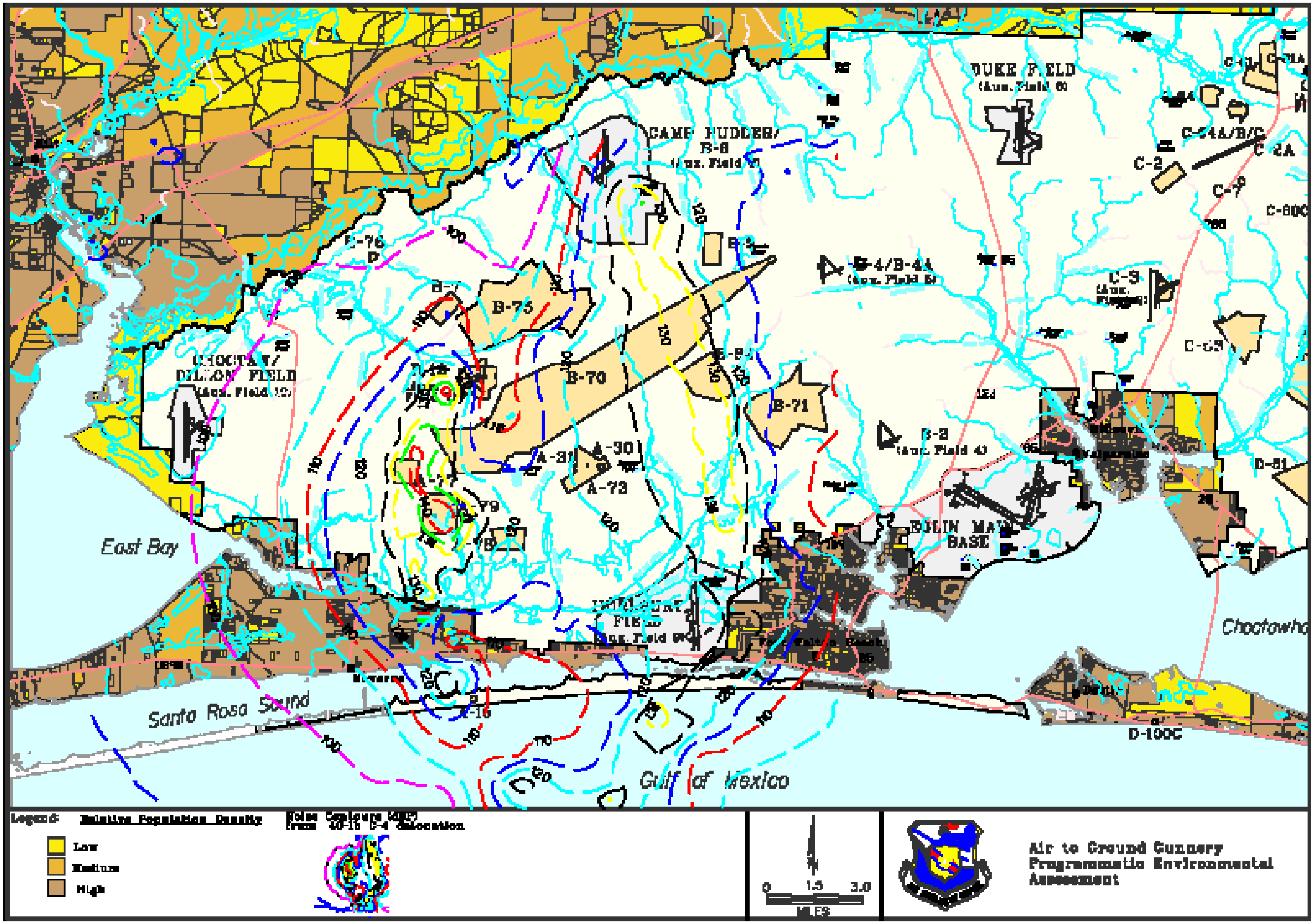

Figure 4-5. Noise From 40-lb C-4 Detonations Modeled Under Unfavorable Weather Conditions

Environmental Justice and Child Safety Impacts From Noise

Environmental justice impacts are defined as disproportionately adverse health effects on low-income or minority populations. An environmental justice analysis requires identification of minority and low-income populations, as is done here, and analysis of whether the Proposed Action and alternative would have a disproportionately high and adverse effect on those populations. Analysis includes a review of (a) the demographic characteristics of the populations affected when compared to the general population, (b) potential impacts identified in other portions of this document, and (c) the location and significance of those effects.

Under the current level of activity, the only anticipated consequence to residential areas is impacts from noise. The noise levels exceed the 62-dB threshold for the annual C-weighted day/night noise level (L_{Cdn}) that determines public annoyance. Given the current level of activity, the L_{Cdn} noise contours derived from munition activities at A-79 extend beyond the boundaries of the Eglin reservation and into residential areas within Santa Rosa County.

When using the Santa Rosa County ratios as the COC, these contours extend into areas with environmental justice concerns. Specifically, the noise contour from A-79 extends into a minority/low-income area (Figure 4-6). The noise from A-78 extends off the reservation and runs up against a minority area (Figure 4-6). If, however, the Eglin ROI ratios are used for the COC, a far smaller residential area with environmental justice concerns is impacted. Given the fact that the activities described in this analysis take place on the far west side of the Eglin reservation within Santa Rosa County, the single county comparison is used.

As described above, environmental justice impacts are determined by evaluating any disproportionate health impacts to minority or low-income communities. While the noise levels extend beyond the range into areas with the potential for environmental justice concerns, it must be noted that the noise levels exceed public annoyance levels but do not translate into direct adverse health impacts. These potential impacts may result in complaints from the local community. Figure 4-7 shows the relatively few number of residences that exist within the noise contour lines from A-78 and A-79 exceeding the L_{Cdn} of 62 dB. However, as Alternative 1 does not present any increase in level of activity, there would be no anticipated increase in complaints from these communities. No potential impacts to the public, including low-income, minority populations, or children, are anticipated. As a result, there would be no disproportionately adverse health effects to these groups and thus, no environmental justice concerns or special risks to children.

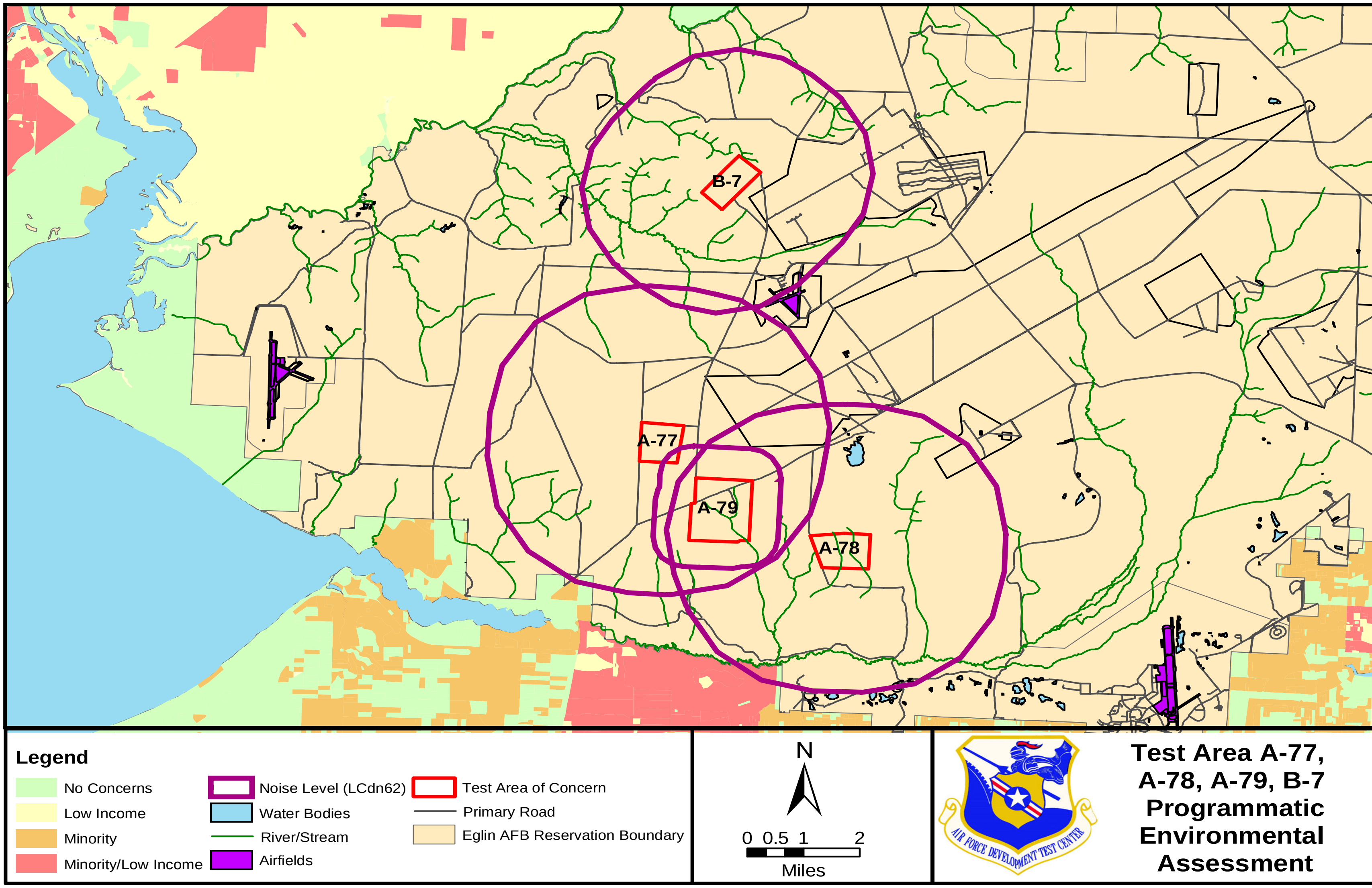

Figure 4-6. Noise Contours and Environmental Justice Areas of Concern

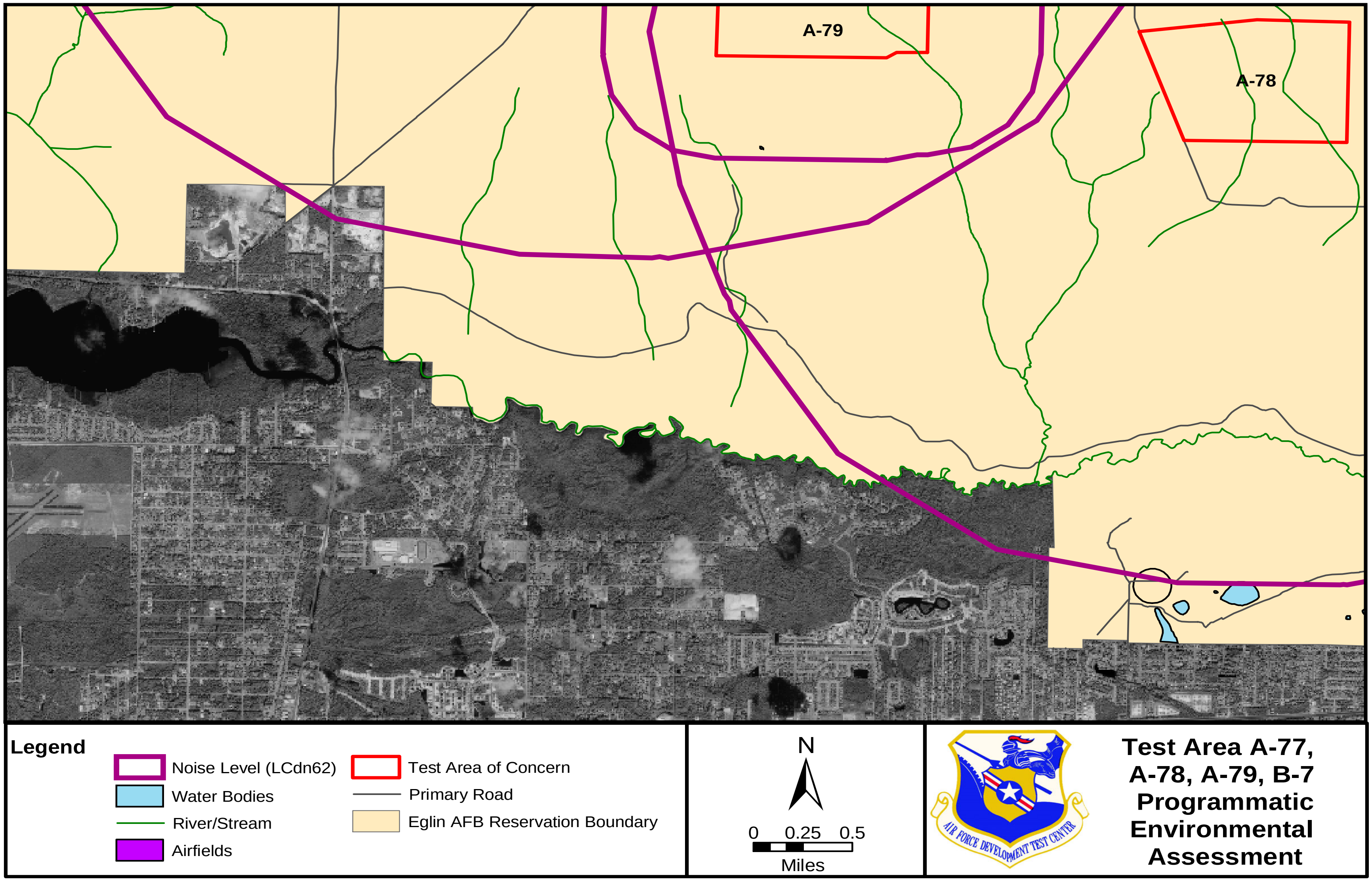

Figure 4-7. Aerial Photograph Revealing Homesteads within Environmental Justice Areas of Concern

Potential Noise Impacts to Wildlife

Potential for Noise Injury to Red-cockaded Woodpeckers from Munitions

Bomb and artillery noise impacts to red-cockaded woodpeckers (RCWs) have been assessed; this section discusses results. The maximum safe noise exposure level for humans without ear protection is 140 dBP, a threshold that is based on exposure to 100 140-dBP noise events over a 24-hour period (U.S. Air Force, 1996). This conservative but reasonable threshold should suffice for estimating potential noise impacts to RCWs in the absence of any specific threshold for the species. The effects of the largest explosive used at each of the ranges were analyzed, excluding bombs detonated during the Navy Pre-Deployment exercises. The impacts from Naval training was addressed in the *Navy Pre-Deployment Training at Eglin AFB, Florida, Final Environmental Assessment* (U.S. Air Force, 2004), and therefore that document should be referenced for noise concerns with Mk-82 bombs on ATGG ranges.

Noise from bombs and artillery was modeled using the NAPS model developed by Dr. Jim Luers of the Dayton Research Institute (Dayton Research Institute, 1990). The model estimates the peak noise intensity, expressed as pressure decibels or dBP, at ground level in all directions surrounding a blast source. The TNT-equivalent net explosive weight and desired weather conditions are input into the model and noise in decibels by distance from the noise source are generated in the output. A favorable (meaning not conducive to propagating noise) weather scenario of no winds and no temperature inversions was input into the model for the Mk-82, for the 40-lb C-4 charge, for the 25-lb rocket, and for the 7-lb gunnery ordnance. These munitions were selected for analysis because they have the potential to affect the largest area in terms of noise impacts of all munitions currently used on the respective TAs. Winds and inversions have little effect on noise greater than 140 dBP; thus other scenarios were not considered.

Analysis of RCW locations reveals that impacts from noise would be minimal. In the past, detonations in Johnson's Pond created noise impacts that had the potential to injure RCWs at the 140-dB and 154-dB levels. The following table (Table 4-8) presents information for the area of impact and the number of active RCW cavity trees affected by the detonation of an Mk-82.

Table 4-8. Noise Impact Zones of Mk-82 at Johnson's Pond, Test Area A-79

	154 dBP	140 dBP
Impact radius (feet)	750	2490
Impact area (acres)	40	450
Number of active RCW trees	4	6

Six active RCW trees would be exposed to 140 dBP, while four active RCW trees would be exposed to noise at the 154-dBP level (Figure 4-8). This testing would result in potential injury to endangered species. Although historically, an average of one bomb has been dropped each year from 1998 to 2001, the Navy has ceased using TA A-79; therefore, no impacts from this heavy ordnance are anticipated. If use of the Mk-82 in Johnson's Pond were reinitiated, consultation with USFWS would be needed to abate the potential for injury to RCWs on the test range.

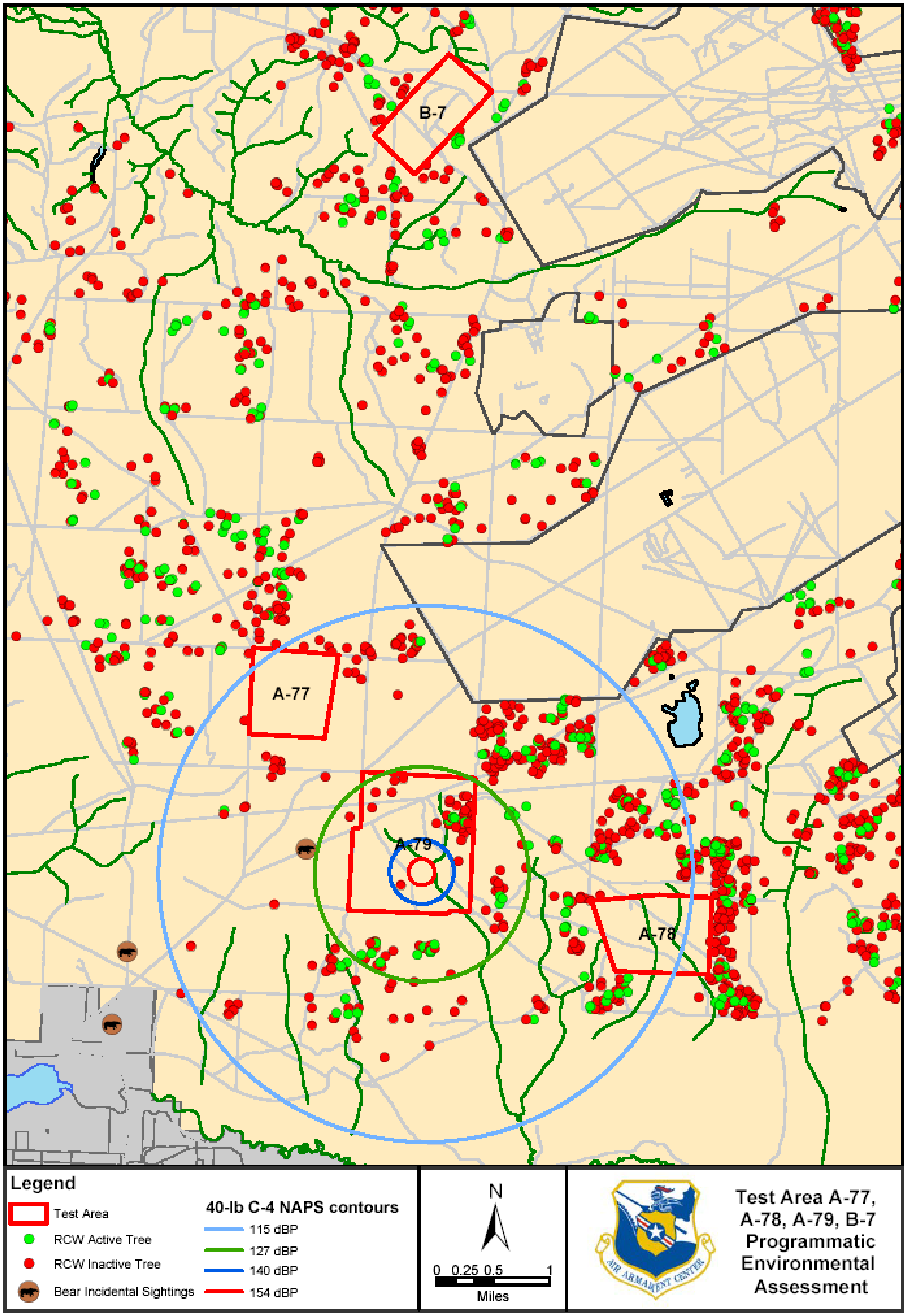

Figure 4-8. TA A-79 Potential Noise Effects to Protected Species

From the same model for noise as used for the analysis of Mk-82 detonations, the impact area for the largest ordnance used in the clay pit on A-79, the 40-lb C-4 charge, was estimated. Table 4-9 below provides information on the area of impact, as well as the number of RCW cavity trees impacted.

Table 4-9. Noise Impact Zones of 40-lb C-4 Charge at the Clay Pit, Test Area A-79

	154 dBP	140 dBP
Impact radius (feet)	500	1495
Impact area (acres)	18	161
Number of active RCW trees	0	0

During training exercises in the clay pit, noise exposure would potentially occur to some forage areas as well as one inactive cavity tree on A-79, but no active RCW trees would be impacted by this detonation at either the 154-dBP or 140-dBP level (Figure 4-8).

Noise analyses were conducted for TAs A-77 and A-78 where 25-pound rockets, the largest ordnance used in these areas, have historically been deployed during ATGG testing. The 25-lb rocket was chosen for analysis because it is the most powerful explosive used on these test areas and thus shows the maximum potential for impacts to RCWs. Also, use of the target areas closest to RCW trees provides an artificially high number of impacted trees because the rockets likely are not actually targeted that close to the trees, and in fact could be a sufficient distance away that they would not impact any RCW trees. Because information was not available on which target areas on A-77 and A-78 were used for the rockets, for conservative analysis, it was assumed that the rockets were fired on the target areas closest to active RCW trees in order to show maximum potential impacts (Figure 4-9).

Table 4-10 provides information on the impact area as well as the number of active RCW cavity trees impacted at A-77 and A-78 by 25-pound rockets, the largest ordnance used in these areas. Analysis showed that at the conservative 140-dBP level, 22 active RCW trees adjacent to TAs A-77 and A-78 would be impacted by this detonation. However, at the 154-dBP level, no RCWs would be impacted. During the four years of data captured between 1998 and 2001, this ordnance was only used in 1999. Rockets were fired only twice on A-77 and only six times on A-78 in 1999. Therefore, the frequency of impacts of noise from this large detonation is minimal. Based on the analysis, consultation with the USFWS may not be necessary for potential noise impacts to RCWs on TAs A-77 and A-78.

Table 4-10. Noise Impact Zones of 25-lb Rocket at Test Areas A-77 and A-78

	154 dBP	140 dBP
Impact Radius (feet)	498	1243
Impact Area (acres)	18	134
Number of Active RCW Trees Impacted A-77 TT-1	0	3
Number of Active RCW Trees Impacted on A-78 at TT-12	0	19

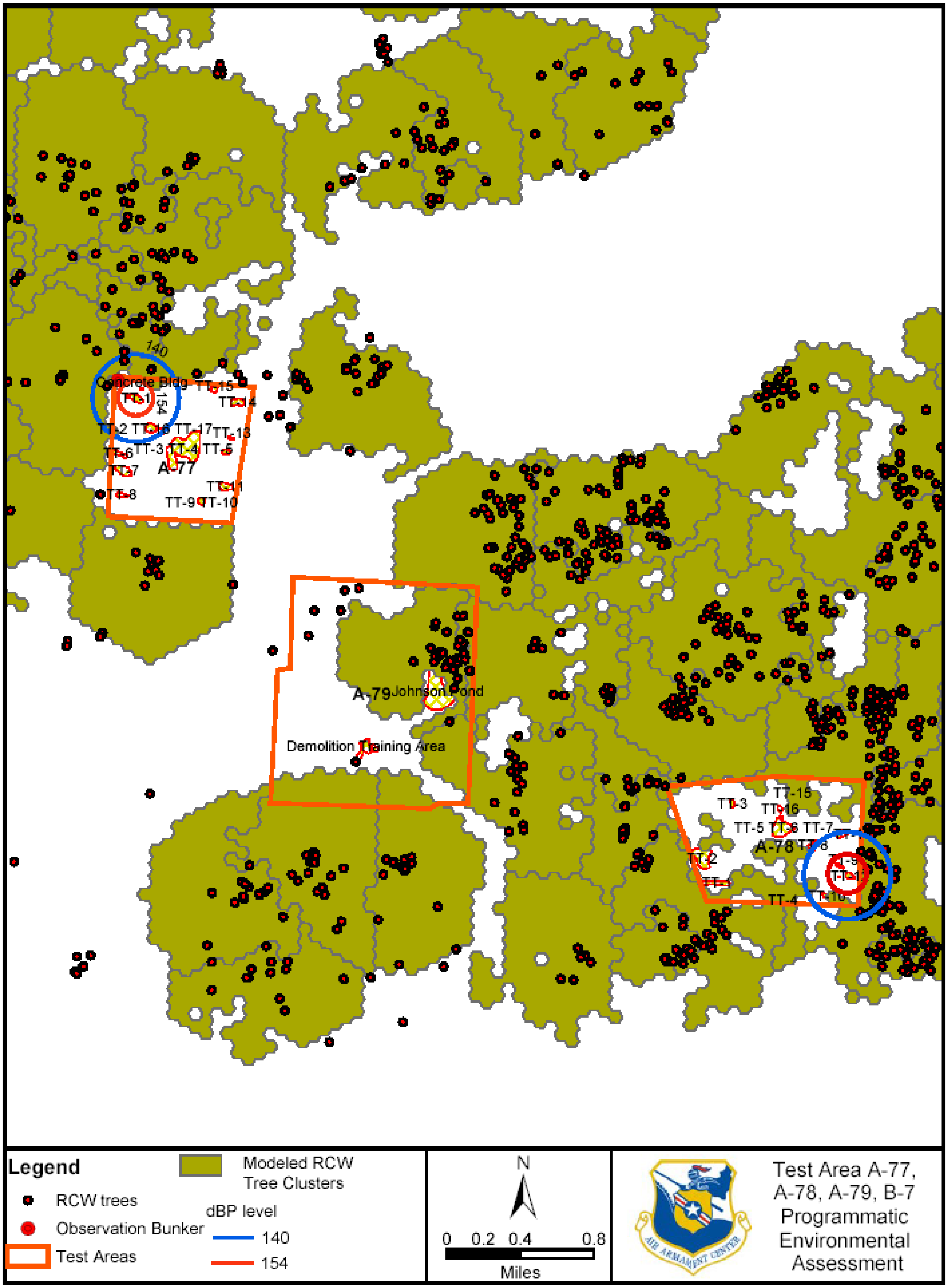

Figure 4-9. TA A-77 and A-78 Potential Noise Impacts to Protected Species

Finally, analyses were conducted for 7-lb gunnery charges on Test Area B-7. This ordnance has the highest NEW for any of the munitions used on this site. A total of 1,133 7-lb gunnery charges have been expended on this range since 1998. The average expended among the four years was 283 rounds. The maximum discharged on the range occurred in the year 2000 at 518 rounds expended. For conservative analysis, it was assumed that the target area closest to active RCW trees was used for all of the 7-lb gunnery activity in order to show maximum potential for impacts to RCWs.

Table 4-11 provides information on the impact area and active RCW trees impacted by the largest ordnance employed during ATGG exercises on Test Area B-7. At the 140-dBP level, five red-cockaded woodpecker cavity trees would be exposed to potentially injurious noise. Use of the 7-lb gunnery on B-7 is frequent and the noise it produces is repetitious. Continuous noise at levels around 140 dBP injures human ears, and assuming that it would cause similar injury to RCWs, impacts from the use of this ammunition would be of more concern than the infrequent rocket use on Test Areas A-77 and A-78. However, analysis assumed that the target area closest to active RCW trees was used for all 7-lb gunnery activities, but in reality, it may be used a safe distance from the RCW trees. Therefore, noise impacts to RCWs may be less than that modeled. Because locations where the 7-lb gunnery is used are uncertain, consultation with USFWS may be required because of the impacts to RCWs.

Table 4-11. Noise Impact Zones of 7-lb gunnery on Test Area B-7

	154 dBP	**140 dBP**
Impact Radius (feet)	**252**	**998**
Impact Area (acres)	9	107
Number of Active RCW Trees	0	5

Across Eglin, no difference in group size or behavior of RCWs has been observed in areas near test areas versus areas without gunnery operations (Hagedorn, 2003). RCWs probably have become habituated to the noise of munitions within the four test sites, and continue to nest successfully in close proximity to the test areas (Hagedorn, 2003). Suitable habitat appears to outweigh any negative influences associated with noise. Studies at a Navy bombing range in Mississippi have indicated that RCWs can acclimate to excessive noise levels (Jackson, 1980). Observations have indicated that many animals become adapted to human activities and noises (Busnel, 1978). Scientists who have researched the effects of noise on wildlife report that animals will react with a startle effect from noises, but adapt over time, so that even this behavior is eradicated (Busnel, 1978). Based on the fact that the RCW population continues to grow at Eglin, it appears that they have adapted to much of the noise associated with military missions. However, it may be necessary to consult with the USFWS for noise impacts to RCWs that are dependent on the actual locations on the test areas where munitions are being used.

Potential Noise Impacts to Red-cockaded Woodpeckers from Ground Movement

Vehicle and troop movement could potentially create noise and disturbance that could affect RCWs; however, due to unexploded ordnance (UXO) contamination, ground movement is minimal on all of the test areas. No active cavity trees occur on Test Areas A-77, A-78, and B-7, but there are some active cavity trees on Test Area A-79. Currently, the only ground activity on A-79 is demolition training in the clay pit discussed under the previous section. The range of

influence for noise impacts from the C-4 detonations far outweigh the range of noise impacts from ground activity in the clay pit; thus, since no RCWs were found to be impacted by noise from the C-4 detonations (shown previously in Figure 4-9), no impacts are anticipated to RCWs from noise associated with ground activities on A-79. No significant noise impacts to RCWs from ground movement are anticipated on these test areas.

Potential Noise Impacts to Red-cockaded Woodpeckers from Aircraft

Responses by birds to aircraft-induced noise varies by species. The impacts range from no disturbance to changes in reproductive and breeding success. In a recent study, Delaney et al., (2000) found that RCWs did not leave their cavity trees when helicopters were greater than 100 meters from their nest. Additionally, flushes from nesting trees decreased with increasing distances between birds and overhead aircraft. Helicopter engines make a continuous noise, with impulses sometimes arising from pulsating rotor blades. Research has shown that continuous noises are less likely than short blasts to induce a response by wildlife. In fact, it has been shown that military blast noise poses a greater threat than this type of continuous noise. Additionally, the aircraft used in ATGG missions, the AC 130H, would not fly below 915 meters, and thus would not induce flushing of RCWs from cavity trees (Larkin, 1996). Minimal impacts to RCWs are anticipated from aircraft noise.

Potential Noise Impacts to the Southeastern American Kestrel

Findings by Black et al. (1984) and Gladwin et al. (1988) suggest that avian nesting and reproduction success may be more heavily dependent on factors associated with location, climate, and provisions of habitat rather than noise. In addition, research by Busnel (1978) suggests that animals react with startle behaviors to noise, but over time this reaction may subside. Avian species have also been documented to exhibit resilience and adaptation in becoming accustomed to various types and frequencies of aerial and ground-based noise events with only slight or insignificant decreases in nesting success and productivity (Platt, 1977; Anderson et al., 1989; Ellis et al., 1991).

Ground-based noise events have been shown to have a greater potential impact on birds than aerial disturbance. Grubb and King (1991) identified ground-based noise as having a higher response frequency and severity in Arizona bald eagles (*Haliaeetus leucocephalus*) than aerial disturbances. Delaney et al. (1999) also found the Mexican spotted owl (*Strix occidentalis lucida*) had an elevated flush response to ground-based noise. Potential exists for noise impacts to sensitive bird species resulting from ground movements; however, ground movement is minimal in these test areas due to UXO contamination. Ground movements may disturb the species on an intermittent, temporary basis, but no significant impacts to the kestrel are anticipated.

4.2.2 Alternative 2

This alternative represents an authorization of the activities analyzed in Alternative 1. Thus, there would be no difference with respect to noise.

Environmental Justice Impacts from Noise

As described under Alternative 1, noise above the public annoyance threshold level extends into areas with environmental justice concerns, namely minority and low-income areas. However, this would not translate into disproportionate adverse health effects on low-income or minority populations. Public notification of mission schedules when munition activity is expected to increase may decrease the number of complaints received from the local community. No environmental justice impacts are anticipated.

Potential Noise Impacts to Wildlife

Impacts from noise in Alternative 2 would not vary greatly from Alternative 1. However, employment of BMPs could reduce impacts to species. Use of targets should be shifted to internally established targets that are away from active RCW cavity trees. This action would reduce the potential for impacts to RCWs. It has been found that haphazardly timed and variable noise creates higher levels of disturbance to wildlife. Therefore, firing and overflight activities should occur at regular intervals, when possible.

Guidelines presented in the Management Guidelines for the Red-cockaded Woodpecker on Army Installations and corresponding USFWS Biological Opinion would minimize potential noise and disturbance from ground movement activities (U.S. Army, 1996; USFWS, 1996). An important aspect of the Biological Opinion is the recognition of a 200-foot buffer zone around individual RCW cavity trees and the concurrence regarding the types of activities allowed within the 200-foot buffer that would not result in impacts to RCWs. The USFWS agreed with the U.S. Army that transient foot traffic within 200 feet of RCW cavity trees would have no effect on RCWs, nor would transient vehicle traffic that stayed on existing roads (U.S. Army, 1996; USFWS, 1996). Transient activities are defined as those that involve maneuver-type training, have low-intensity human activity, and a short-term (less than two-hour) human presence (U.S. Army, 1996). Activities that are not allowed within the 200-foot buffer zone include bivouacking and establishing command posts and excavating/digging.

The proponent may be required to mark 200-foot buffer zones around active RCW cavity trees potentially impacted by ground movements. Additionally, military activities that are within or near stands of mature longleaf pine and scheduled during red-cockaded woodpecker nesting season (late April through July) should be coordinated with Eglin's Natural Resources Branch. Monitoring of RCWs should also continue.

4.2.3 Alternative 3

Alternative 3 proposes a 50 percent increase in activity over levels described in Alternative 1.

Noise Impacts to the Surrounding Community

Aircraft Noise

Based on analysis in the Overland Air Operations PEA (U.S. Air Force, 1998), which indicated that increases in aircraft sorties up to 600 percent would not have appreciable noise impacts on

the community, increases in aircraft noise under this alternative would not significantly affect the surrounding community.

Average Ground-Based Noise

Average ground-based noise would increase under this alternative. Table 4-12 reflects aggregated noise levels at a range of distances from TA A-77. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-12. Alternative 3 Average Ground-Based Noise From Test Area A-77 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	70.4	69.8
2	65.4	64.9
3	62.3	**61.8**
3.2	**61.9**	Not calculated

Table 4-13 reflects aggregated noise levels at a range of distances from TA A-78. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-13. Alternative 3 Average Ground-Based Noise From Test Area A-78 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	70.1	69.1
2	65.3	64.2
2.6	Not calculated	62.1
3	62.2	**61.2**
3.1	62.0	Not calculated

Table 4-14 reflects aggregated noise levels at a range of distances from TA A-79. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}. As with Alternative 1, average yearly noise is relatively low while average daily noise is comparatively high due to the amount of net explosive used on mission days.

Table 4-14. Alternative 3 Average Ground-Based Noise From Test Area A-79 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	73.1	**57.5**
2	68.6	Not calculated
3	65.6	Not calculated
4	63.4	Not calculated
4.8	62.0	Not calculated
5	**61.7**	Not calculated

Table 4-15 reflects aggregated noise levels at a range of distances from TA B-7. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-15. Alternative 3 Average Ground-Based Noise from Test Area B-7 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	Yearly
1	70.6	68.4
2	64.9	62.7
2.3		62.0
2.8	62.0	Not calculated
3	**61.5**	**59.3**

Impulse Noise from Detonations

The maximum level of noise that occurred during the baseline would be the same for this alternative; thus, noise impacts would not change in intensity and an expansion of noise impacts from single-event detonation noise would not occur. However, the number of detonations would increase by 50 percent, providing increased opportunity for these detonations to occur on unfavorable weather days.

Environmental Justice Impacts from Noise

A 50 percent increase in activity at TAs A-77, A-78, A-79, and B-7 would increase the diameter of the noise contour representing the L_{Cdn} above 62 dB. As a result, a larger impact area outside of the range would exist and a larger residential area representing environmental justice areas of concern would be exposed to noise levels above the annoyance threshold (Figure 4-10). As a result, more frequent complaints due to noise on the range may be made. However, environmental justice impacts that include disproportionate health impacts to low-income or minority communities are not anticipated.

Potential Noise Impacts to Wildlife

An increase in ATGG testing would increase the amount of expended ordnance, thereby increasing the frequency for potential noise impacts by an unknown probability; however, the area of impact would remain the same under this scenario. RCWs appear to have acclimated to munitions and aircraft noise on the test areas, as evidenced by their presence on and around A-77, A-78, A-79, and B-7. An increase in the frequency of activities would not be expected to impact RCWs in the area. However, monitoring of these populations should be continued in order to detect possible changes in the population that may be related to the increase in ATGG activities.

4.2.4 Alternative 4

Noise Impacts to the Surrounding Community

Aircraft Noise

Based on analysis in the Overland Air Operations PEA (U.S. Air Force, 1998), which indicated that increases in aircraft sorties of up to 600 percent would not have appreciable noise impacts on the community, 100 percent increases aircraft sorties under this alternative would not significantly affect the surrounding community.

Average Ground-Based Noise

Alternative 4 proposes a 100 percent increase in activity over levels described in Alternative 1. Average ground-based noise would increase under this alternative. Table 4-16 reflects aggregated noise levels at a range of distances from TA A-77. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-16. Alternative 4 Average Ground-Based Noise From Test Area A-77 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	71.6	71.1
2	66.7	66.2
3	63.5	63.0
3.5	Not calculated	**61.8**
3.7	62.0	Not calculated
4	**61.3**	**60.7**

Table 4-17 reflects aggregated noise levels at a range of distances from TA A-78. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-17. Alternative 4 Average Ground-Based Noise From Test Area A-78 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	71.4	70.4
2	66.5	65.5
3	63.4	62.4
3.1	Not calculated	62.0
3.6	62.0	Not calculated
4	**61.2**	**60.1**

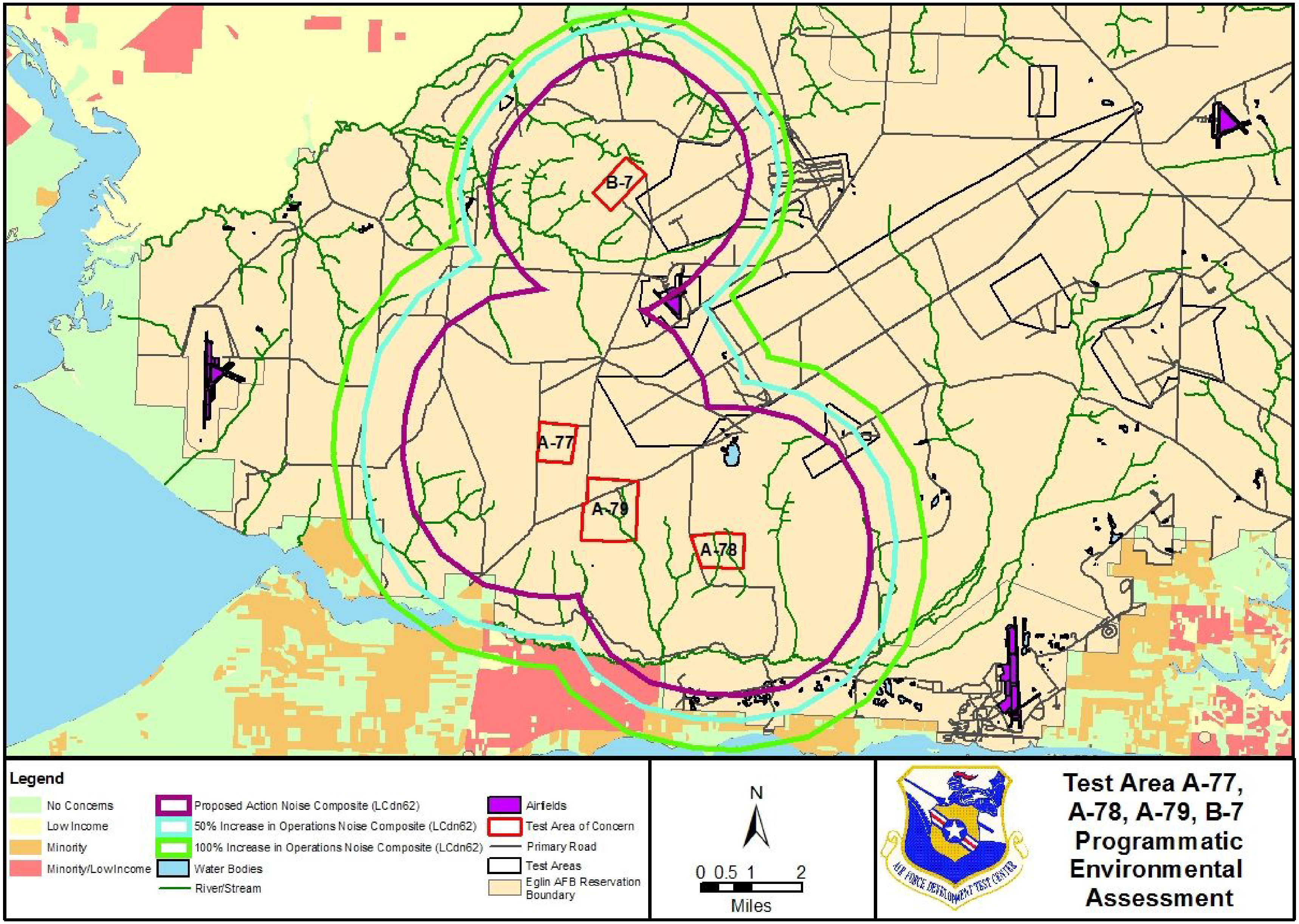

Figure 4-10. Alternatives 3 and 4 Environmental Justice Noise Impacts

Table 4-18 reflects aggregated noise levels at a range of distances from TA A-79. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}. As with Alternatives 1 and 3, average yearly noise is relatively low while average daily noise is comparatively high due to the amount of net explosive used on mission days.

Table 4-18. Alternative 4 Average Ground-Based Noise From Test Area A-79 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	74.4	58.7
2	69.8	Not calculated
3	66.9	Not calculated
4	64.7	Not calculated
5	62.9	Not calculated
5.6	**61.9**	Not calculated
6	**61.5**	Not calculated

Table 4-19 reflects aggregated noise levels at a range of distances from TA B-7. Shown are the calculated noise levels for a daily exercise, and those same levels annualized. The distances and levels highlighted show where the noise level falls below 62 L_{Cdn}.

Table 4-19. Alternative 4 Average Ground-Based Noise from Test Area B-7 Missions

Distance In Miles	L_{Cdn} Values	
	Daily	**Yearly**
1	71.8	69.6
2	66.1	63.9
2.5	Not calculated	62.1
3	62.7	**60.5**
3.3	**61.8**	Not calculated
4	**60.3**	**58.1**

Impulse Noise from Detonations

The maximum level of noise that occurred during the baseline would be the same for this alternative; thus, noise impacts would not change in intensity and an increase of noise impacts from single-event detonation noise would not occur. However, the number of detonations would increase by 100 percent, providing increased opportunity for these detonations to occur on unfavorable weather days.

Environmental Justice Impacts from Noise

A 100 percent increase in activity at TAs A-77, A-78, A-79, and B-7 would substantially increase the diameter of the noise contour representing the L_{Cdn} above 62 dBC (Figure 4-10). As a result, a larger impact area outside of the range would exist and a larger residential area representing environmental justice areas of concern would be exposed to noise levels above the annoyance threshold. As a result, more frequent complaints due to noise on the range may be made. However, environmental justice impacts that include disproportionate health impacts to low-income or minority communities are not anticipated.

Potential Noise Impacts to Wildlife

An increase in ATGG testing would increase the amount of expended ordnance, thereby increasing the frequency for potential noise impacts by an unknown probability; however, the area of impact would remain the same under this scenario. RCWs appear to have acclimated to munitions and aircraft noise on the test areas, as evidenced by their presence on and around A-77, A-78, A-79, and B-7. An increase in the frequency of activities would not be expected to impact RCWs in the area. However, monitoring of these populations should be continued in order to detect possible changes in the population that may be related to the increase in ATGG activities.

4.3 RESTRICTED ACCESS/SAFETY

Restricted access pertains to the temporary closure of test areas, interstitial areas, public roads, or airspace because of mission activities. The purpose of restricting access to the public during these times is to ensure their safety while maintaining mission integrity. Receptors potentially impacted would include the military and the public desiring to use roads, test areas, recreational areas, or airspace. Restricted access impacts would be associated with mission activities at Test Areas A-77, A-78, A-79, and B-7 involving the detonation of live munitions and other testing/training missions.

Testing and training on Test Areas A-77, A-78, A-79, and B-7 requires control of the airspace and land that are part of the mission scenario. Access restriction ensures safety to nonparticipants and protects mission integrity. Specifically, military testing and training can be dangerous to anyone not directly participating in the activity. Conversely, external actors can adversely impact training and testing safety and control. For each military training activity on Test Areas A-77, A-78, A-79, and B-7, the Air Armament Center Safety Office develops a safety footprint. This footprint determines if any access restriction is warranted and the extent of the restriction. Although it is not further discussed in this document, access restrictions limit unrelated military activities and movements. Restricted access impacts are:

- Airspace restrictions to nonparticipating aircraft (not covered in this document).
- Restrictions to training missions due to test areas and road closures.
- Restrictions to the public to recreational areas due to road closures.

Limits to public access to air creates nuisance. Airspace restrictions are coordinated with the Federal Aviation Authority. Eglin AFB has the authority to restrict access to its property for any testing and training missions. Airspace restrictions are not covered in this document because they have been adequately addressed in the Overland Air Operations PEA (U.S. Air Force, 1998).

4.3.1 Alternative 1 (No Action Alternative)

Test Areas A-77, A-78, A-79, B-7 are restricted areas (shown previously in Figure 3-5) and the public is not allowed in these areas for recreational purposes. Therefore, no safety issues to the public are anticipated. UXO encountered during ground troop movement and training is a safety

concern on TAs A-77, A-78, and B-7. In accordance with Eglin AFB's current method of operation, AAC/SE would need to analyze any new action with respect to risk form UXO. Potential impacts to human safety would be minimized through this process.

4.3.2 Alternative 2

Potential impacts to restricted access and safety are the same as for Alternative 1.

4.3.3 Alternative 3

Increased frequency of missions may cause extended time in range closure, thus impact to restricted access and safety may ensue.

4.3.4 Alternative 4

Potential impacts to restricted access and safety are the same as for Alternative 3.

4.4 DEBRIS

Debris, such as shell casings, canisters from flares, inert bombs, small arms and gun rounds as well as litter and refuse from ground troop movement, may be deposited on or adjacent to the test areas. If left in place and not properly disposed of, this debris may have the potential to result in environmental impacts.

Personnel movement may occur on established roads, along or across streams, through cleared areas or wooded areas, and through swamp environments. Most ground training on foot involves movement without leaving any evidence of troop presence. Impacts from litter or refuse at test areas are not anticipated as activity on these test areas is comprised primarily of air-to-ground gunnery.

4.4.1 Alternative 1 (No Action Alternative)

The *Interstitial Area Final Programmatic Environmental Assessment* (U.S. Air Force, 1998a) analyzed the environmental impact of increasing yearly ground troop movement in interstitial spaces from 55,800 troops per year (1997) to 167,500, equal to 200 percent. No environmental impacts were determined from the 200 percent increase in ground troops regarding debris and the use of blanks, smokes, and flares during ground troop training activities in interstitial spaces.

UXO and debris cleanup from around test area targets is conducted yearly and annual averages, as provided by Eglin AFB 96 CES/CESD, are as follows (Gray, 2003).

<u>TA A-77</u>
1 each - M1 105 mm Projectile
9 each - Mk-6 MOD 1 Signal Flare
82 each - PGU/9 40 mm Projectile
96 each - BDU 33 Practice Dumb Bomb
183 each - PGU/38 25 mm Projectile
18,300 each - M56 series 20 mm Projectiles

<u>TA A-78</u>
400 each - 7.62 mm Projectiles
7 each - Mk-6 MOD 1 Signal Flares
200 each - PGU/38 25 mm Projectiles
29 each - PGU/9 40 mm Projectiles
15,000 each - M56 series 20 mm Projectiles

<u>TA B-7</u>
1 each - BDU 33 Practice Bomb
200 each - PGU/38 25 mm Projectiles
1,200 each - M56 series 20 mm Projectiles
15 each - PGU/9 40 mm Projectiles

Baseline training activities input over 2 million ordnance items onto TAs A-77 and A-78 and over 100,000 items at TA B-7. Only four items would be expended on the A-79 range. A table is provided in Appendix I for the baseline projections for amounts of debris associated with ATGG activities. The following amount of the total annual material would be removed based on average annual UXO clean up presented above (Gray, 2003).

	A-77	A-78	A-79	B-7
Percent UXO Removal:	0.60	0.47	0.00	1.19

AAC Plan 32-5 and AAC Plan 32-9 for debris management for hazardous materials management, recycling and proper disposal of wastes should be complied with following training activities to reduce potential impacts from debris at ATGG ranges. The *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) outlines procedures to be followed to reduce potential impacts from debris.

4.4.2 Alternative 2

Alternative 2 would authorize the baseline activity at A-77, A-78, A-79, and B-7. It is recommended that solid debris from rounds from small arms/guns, flares, and inert bombs be removed in accordance with Eglin operating procedures. In addition, range sustainability practices as outlined in Appendix B are recommended to reduce the potential for impacts from debris.

4.4.3 Alternative 3

Training activities for Alternative 3 would input over 3 million ordnance items onto TAs A-77 and A-78 and over 100,000 items at TA B-7. Only six items would be expended on the A-79 range. Appendix I provides the table for expended debris on ATGG Test Areas. The following amount of the total annual material would be removed based on average annual UXO clean up (Gray, 2003).

	A-77	A-78	A-79	B-7
Percent UXO Removal:	0.40	0.31	0.00	0.79

AAC Plan 32-5 and AAC Plan 32-9 for debris management for hazardous materials management, recycling and proper disposal of wastes should be complied with following training activities to reduce potential impacts from debris at ATGG ranges. Range sustainability practices outlined in Appendix B are recommended to reduce potential impacts to the test areas due to debris. In addition, *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) outlines procedures to be followed to reduce potential impacts from debris.

4.4.4 Alternative 4

Training activities for Alternative 4 would input over 5 million ordnance items onto TA A-77, over 4 million ordnance items at TA A-78, and over 200,000 items at TA-B-7. Only eight items would be expended on the A-79 range. Appendix I provides a table detailing the maximum amount of debris projected under this alternative. The following amount of the total annual material would be removed based on average annual UXO clean up (Gray, 2003).

	A-77	**A-78**	**A-79**	**B-7**
Percent UXO Removal:	0.30	0.23	0.00	0.59

AAC Plan 32-5 and AAC Plan 32-9 for debris management for hazardous materials management, recycling and proper disposal of wastes should be complied with following training activities to reduce potential impacts from debris at ATGG ranges. Range sustainability practices outlined in Appendix B are recommended to reduce potential impacts to the test areas due to debris. In addition, the *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) outlines procedures to be followed to reduce potential impacts from debris.

4.5 HABITAT ALTERATION

A habitat in this instance refers to the ecological and geomorphological components, such as vegetation, soil, topography, and water that support organisms. Habitats may be altered by a variety of factors, including changes in vegetation, structure, food sources, breeding and nesting areas, etc. Habitat alteration may lead to decreased survival of sensitive species or degradation of areas critical to overall species diversity. Habitat alteration can result from activities such as accidental wildfires resulting from gunnery fire.

This section analyzes the potential for mission activities to impact the physical condition of habitats associated with Test Areas A-77, A-78, A-79, and B-7. While difficult to quantify, the potential for habitat alteration to occur can be evaluated qualitatively and minimization procedures can be identified that would reduce the potential for adverse impacts. To analyze habitat alteration, authors consulted available literature and maps on wetlands, floodplains, flatwoods salamander and bog frog habitats, RCW active and inactive cavity trees, and other habitats within the region of influence and communicated directly with parties knowledgeable about resources and potential impacts in the region of influence.

4.5.1 Alternative 1 (No Action Alternative)

Potential Impacts to Sensitive Species Habitat

Red-cockaded Woodpecker Habitat

With 313 active clusters, Eglin AFB is home to the fourth largest population of the federally endangered red-cockaded woodpecker (*Picoides borealis*). As such, Eglin AFB is considered to be crucial for the downlisting and recovery of this species. Red-cockaded woodpeckers (RCWs) excavate roost and nest cavities through the living sapwood of southern pine trees. The RCW prefers longleaf pines older than 85 years old due to their susceptibility to red heart disease, which softens the wood and makes it less difficult to excavate. Because cavity excavation requires a substantial investment of time and energy, it is extremely important to protect these cavity trees.

On Eglin, RCWs occupy open, park-like stands of longleaf pine sandhills and flatwoods. These habitats require frequent prescribed fire to maintain their grassy understory and to prevent midstory encroachment. In the absence of frequent fire, hardwoods quickly encroach into the midstory of longleaf pine ecosystems, allowing predators access to cavity trees. For the RCW, fire maintains the native groundcover that supports the insects and other arthropods upon which RCWs feed. While prescribed fire is critical for the management of the RCW, wildfires under dry or windy conditions may cause substantial mortality to RCW cavity trees. Recent events have shown that wildfires can have widespread, devastating effects on the landscape.

In advance of prescribed fires on Eglin AFB, RCW cavity trees are individually prepared to prevent potential damage. This pre-burn preparation includes mowing vegetation under the tree with a Brown tree cutter out to a distance of 25 feet. Resulting clippings and debris are then raked from the area. If sap from the cavity runs down the tree to within 6 feet of the ground, then the bark is gently scraped to remove that sap, which could otherwise spread fire from the ground up the tree.

An applied research project on Eglin AFB in 2001 studied the effects of cavity tree preparation in advance of burning (U.S. Air Force, 2003a). In total, 814 trees were monitored, including both active and inactive cavities. Cavity tree mortality was three times higher in unprepared trees versus prepared trees (Figure 4-11). This study demonstrates that cavity trees are vulnerable to fire, particularly in the absence of any pre-burn treatments. The study suggests that historic fire suppression, high-grading of old-growth longleaf pine, and the damage caused by cavity excavation by the RCW predispose these trees to mortality (U.S. Air Force, 2003a). When forest managers employ high-grading, they select undiseased, older and larger trees to be cut. The selection results in a forest that has not only smaller and less desirable trees or species, but the wooded area also contains a higher incidence of disease (U.S. Air Force, 2004).

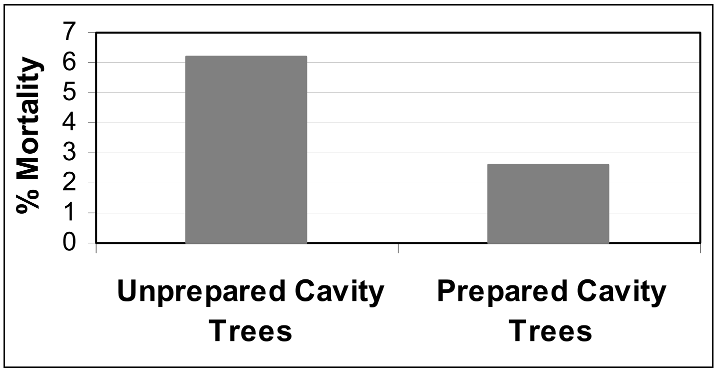

Figure 4-11. Percent Mortality in Prepared Versus Unprepared RCW Cavity Trees

RCWs are found near or on test areas A-77, A-78, A-79, and B-7 (Figure 3-1 in Appendix G). Military operations have the potential to impact RCW cavity trees near to the ranges by causing catastrophic wildfires that escape the ranges following ignition by exploding ordnance. Through live ammunition activities and the use of incendiary devices, wildfires are frequent occurrences. Missions on A-77, A-78, A-79, and B-7 have been responsible for starting 54 wildfires in a five-year period from 1998 to 2002 (U.S. Air Force, 2003b). These areas have the highest density of wildfires on the Eglin AFB reservation. These fires can be either beneficial or harmful to natural communities, depending on the fire severity and efficacy of suppression activities. Although fire is a necessary element to maintaining RCW habitat and the longleaf pine ecosystem, under certain conditions, fires may cause unusually high levels of mortality in canopy trees, particularly RCW cavity trees.

Wildfire suppression activities are restricted around these ranges due to unexploded ordnance (UXO) concerns, particularly unspent 105 mm rounds jettisoned from AC-130 gunships circling around the ranges. Traditional direct fire suppression methods, such as plowing firebreaks, are not an option on and around these test areas. Thus, wildfires in these areas may be very difficult to control. Typically, wildland fire fighting in these areas is confined to block and burn techniques, where suppression teams must hold wildfires by setting counter fires on the network of roads surrounding the ranges. This restriction significantly increases the likelihood that, under adverse conditions, wildfires escaping from these ranges will grow large in size and impact numerous active RCW cavity trees. Ten such large fires (>900 acres) have occurred over the past five years (U.S. Air Force, 2003b).

Wildfires do not allow for the prepping of RCW cavity trees. Wildfires of sufficient severity have the potential to kill significant numbers of RCW cavity trees under adverse conditions. Given that mortality rates for unprepared cavity trees under normal burning conditions may exceed 6 percent (U.S. Air Force, 2003a), wildfires under adverse conditions could be catastrophic. In the five-year period from 1998 to 2002, a total of 189 active RCW cavity trees and 681 inactive cavity trees were burned by wildfires started by Air Force missions on these test areas (U.S. Air Force, 2003c). A total of 119 of these cavity trees died over that period of time from various causes, including fire. Table 4-20 presents causes of wildfire data from 1993 through 2003 for Eglin.

Table 4-20. Eglin AFB Wildfires for 1993 through 2003

Cause	Metric	Year										
		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Air Force Mission	No. of Fires	64	51	45	38	40	42	27	36	46	48	48
	Acres Burned	4,322	4,295	9,554	9,640	2,614	11,917	4,500	2,933	9,599	10,408	6,790
	Average Size*	67.53	84.22	212.31	253.68	65.35	283.74	166.67	81.47	208.67	216.83	141.46
Army Mission	No. of Fires	19	11	11	10	20	18	20	18	14	12	6
	Acres Burned	726	314	2,627	1,245	755	6,140	860	1,975	637	216	1,334.7
	Average Size*	38.21	28.55	238.82	124.5	37.75	341.11	43	109.72	45.5	18	222.45
Arson	No. of Fires	5	3	6	22	1	5	4	2	1	3	3
	Acres Burned	6	56	2,696	2,418	6	60	203	2.6	14	13	19.5
	Average Size*	1.2	18.67	449.33	109.91	6	12	50.75	1.3	14	4.33	6.5
Children	No. of Fires	2	5	2	3	5	3	2	1	1	4	3
	Acres Burned	0	10	251	101	24	0.2	0.5	3	14	181	7
	Average Size*	0	2	125.5	33.67	4.8	0.07	0.25	3	14	45.25	2.33
Hunters	No. of Fires	0	0	0	1	0	1	2	0	0	2	1
	Acres Burned	0	0	0	10	0	0.25	9	0	0	117	0.2
	Average Size*	0	0	0	10	0	0.25	4.5	0	0	58.5	0.2
Lightning	No. of Fires	7	1	4	2	3	6	5	24	7	7	1
	Acres Burned	225	50	221	1	18	174	32	875	110	2,348	10.6
	Average Size*	32.14	50	55.25	0.5	6	29	6.4	36.46	15.71	335.43	10.6
Misc.	No. of Fires	4	9	9	9	9	9	6	7	2	1	2
	Acres Burned	35	986	546	12	346	543	438	3,029	372	378	5.5
	Average Size*	8.75	109.56	60.67	1.33	38.44	60.33	73	432.71	186	378	2.75
Powerline	No. of Fires	4	1	1	2	0	2	0	2	4	1	1
	Acres Burned	14	0	2	1	0	1.2	0	25	58	18	2.3
	Average Size*	3.5	0	2	0.5	0	0.6	0	12.5	14.5	18	2.3
Unknown	No. of Fires	11	5	9	10	5	11	3	19	8	30	9
	Acres Burned	241	3	1,286	44	94	1,580	200	911	180	919	272.9
	Average Size*	21.91	0.6	142.89	4.4	18.8	143.64	66.67	47.95	22.5	30.63	30.32
Navy/Marine	No. of Fires	0	0	0	0	0	0	0	0	0	0	5
	Acres Burned	0	0	0	0	0	0	0	0	0	0	202.8
	Average Size*	0	0	0	0	0	0	0	0	0	0	40.56
Escaped RX	No. of Fires	0	0	0	0	0	0	0	0	0	0	2
	Acres Burned	0	0	0	0	0	0	0	0	0	0	261.8
	Average Size*	0	0	0	0	0	0	0	0	0	0	130.9
TOTALS	No. of Fires	116	86	87	97	83	97	69	109	83	108	81
	Acres Burned	5,569	5,714	17,183	13,472	3,857	20,415.65	6,242.5	9,753.6	10,984	14,598	8,907.3
	Average Size*	48.01	66.44	197.50	138.89	46.47	210.47	90.47	89.48	132.34	135.17	109.97

* Average Size in acres

Due to the potential for wildfires to start on Test Areas A-77, A-78, and B-7 from ATGG activities, a Section 7 consultation with the USFWS will be necessary to address the potential impacts to RCW cavity trees.

Potential Flatwoods Salamander Habitat

Potential flatwoods salamander habitat occurs within the 1-kilometer buffer of TAs A-78 and A-79, but none is located within the boundaries of any of the test areas. Direct impacts to potential flatwoods salamander habitat from munitions is not likely to occur because munitions use is focused on target areas contained within the boundaries of the test areas. Indirect impacts

are more likely, and would involve wildfires that started on the test areas that spread to interstitial areas. These wildfires could potentially affect potential flatwoods salamander habitat, but it would most likely benefit the area by eliminating the St. John's wort that can take over flatwoods salamander ponds in the absence of fire (Palis, 1997). However, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. The suppression activities that are used in some areas to control wildfires (e.g., plowlines) would not be of concern around these test areas because of UXO contamination. Adverse wildfire impacts on potential flatwoods salamander habitat are not anticipated.

Florida Bog Frog Habitat

The only location on the four test areas where bog frogs have been documented is the western headwater branch of Panther Creek on Test Area A-79. No impacts to bog frogs at this site are anticipated because the area is heavily wooded and no missions take place near the site. Additional bog frog sites are located downstream from Test Area A-79 on Panther Creek. Residue from munitions discharged in Johnson's Pond has the potential to impact the downstream populations, but at this time, no future missions involving munitions are planned for this area. Any residue from past missions in Johnson's Pond likely has settled to the bottom of the pond and is bound to the sediments. As long as the earthen dam remains in place, it is not likely that any residue will move downstream and impact bog frog populations.

The bog frog lives in or along clear, shallow, acid seeps and shallow, boggy overflows of larger seepage streams. Water flow must be fairly stable for areas where larvae develop. Therefore, the bog frog is sensitive to changes in hydrology. Any future missions that involve closing the weir on Johnson's Pond would need to consider the potential downstream impacts of the subsequent release of water from the pond. To minimize impacts to the bog frog, water would need to be released slowly to avoid a large flood of water all at one time. At this time, no future missions are planned in Johnson's Pond, so there are no anticipated impacts to the bog frog from changes in hydrology.

Wildfire also has the potential to impact bog frog habitat. Fire controls the growth of hardwoods, increases herbaceous vegetation, and maintains soil moisture, which creates habitat characteristics that enhance the growth and preservation of sphagnum moss on which the bog frog relies. Wildfire is likely beneficial to the bog frog because it helps to control hardwood encroachment; however, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. Adverse wildfire impacts to bog frog habitat are not anticipated.

Potential Impacts to Sensitive Habitats

Tier I Communities, Significant Botanical Sites, and Special Natural Areas

Tier I communities, significant botanical sites, and special natural areas have been identified within 1 km of TAs A-77, A-78, A-79, and B-7, but none of these habitats are located within the boundaries of the test areas (shown previously in Figure 3-6). Ground movement will be minimal and will stay within the confines of the test sites, when and where permitted. No

impacts to these communities are anticipated from ground movement because ATGG training will occur on test sites only.

The major concern for these communities is the spread of wildfire from the test areas. Eglin's two largest tracts of old growth are found just east of A-78 and north of A-77, and the area known as the Patterson Special Natural Area encompasses several tracts of old-growth immediately adjacent to the north and east of TA A-78. Eglin AFB has documented the steady decline in these old-growth longleaf pine resources due to wildfires, wind damage, and prescribed burning. Through research, the conditions to safely prescribed burn old-growth forests have been identified; however, catastrophic wildfire remains the largest single source of old-growth mortality. If catastrophic wildfires continue to occur in these areas, old-growth resources could be negatively impacted.

Wetlands and Floodplains

Wetlands and floodplains are only found in the area surrounding Panther Creek on Test Area A-79 (shown previously in Figure 3-8). No missions involving modification to the floodplain occur, thus no impacts to floodplains are anticipated. Historically, the spillway at Johnson's Pond was closed about once a year for a mission involving the Mk-82, but that has been discontinued. That testing had the potential to temporarily impact wetlands through flooding, but is not currently an issue since testing has been discontinued. If testing involving closure of the spillway were reinitiated, there would be the potential for impacts to wetlands.

Potential Impacts to Water Quality from Sedimentation

Current water quality for Eglin streams is good, but excess sedimentation is a problem for many water bodies on and around Eglin. Runoff from target areas has the potential to affect surface water quality. The frequent physical disturbances of target sites by ordnance impacts and/or explosions create target surfaces that are generally barren and devoid of vegetative cover. In some instances the target surface is kept free of vegetation to expedite the recovery of ordnance debris or to assist in training mission scoring. Table 4-21 depicts the distances between targets and surface waters on each test area.

Extensive vegetative cover exists between the targets and the water bodies, and acts as a pollution filter, intercepting surface water runoff before it reaches the stream or wetland. Vegetative cover around water bodies on the test areas would help to capture sediment during runoff events, minimizing potential impacts to nearby surface waters. The closest that any of the targets is to a water body is 520 feet, allowing sufficient distance for interception and treatment of runoff. Surface water quality on TAs A-77, A-78, and B-7 is not anticipated to be negatively affected by runoff from target areas.

Table 4-21. Proximity of Surface Waters to Target Areas on ATGG Test Sites

Test Area	Target	Surface Waters	Distance Between Target and Water (ft)
A-77	TT-9	Panther Creek	5520
A-77	TT-10	Panther Creek	5520
A-77	TT-8	East Head	6330
A-77	TT-7	East Head	6950
A-78	TT-2	Unnamed wetlands	520
A-78	TT-10	Unnamed wetlands	610
A-78	TT-1	Unnamed wetlands	800
B-7	TT-1	Bear Creek	2395
B-7	TT-2	Bear Creek	2395
B-7	TT-3	Bear Creek	2640

Because there is no vegetation to stabilize soils in the clay pit on TA A-79, sediment runoff is a concern. The closest water body is Panther Creek, which is separated from the clay pit by an approximately 930-foot buffer of trees and other vegetation. Any sediment that might run off from the claypit would be intercepted and treated by this vegetation before reaching Panther Creek. An August 2003 report on Panther Creek stated that the waterbody maintains a healthy biological community, providing support that activities from the clay pit are not impacting Panther Creek. Activities on test area A-79 are not anticipated to negatively impact surface water quality.

4.5.2 Alternative 2

The largest potential agent for habitat alteration on and around test areas A-77, A-78, A-79, and B-7 is wildfire. Below are Best Management Practices (BMPs) that would minimize the potential for catastrophic wildfires near these test areas.

- Follow Eglin Wildfire Specific Action Guide Restrictions for pyrotechnics use by class day; specifically, do not conduct hot missions under class D or E levels as determined by the Wildland Fire Management Program at Jackson Guard.
- Have sufficient resources (i.e., fire management personnel and equipment) available to respond to fire emergencies under marginal conditions.
- Maintain graded road grid around gunship ranges to facilitate suppression in the event of a wildfire ignition.
- Maintain two-year prescribed burn interval within a 2-mile buffer area around all of these ranges to reduce hazardous fuel accumulations.
- Establish post-mission monitoring for one hour to search for smoke and hotspots on the range.

Potential Impacts to Sensitive Species Habitat

Red-cockaded Woodpecker Habitat

Wildfire impacts to RCW cavity trees is the biggest threat to RCW recovery in the areas surrounding test areas A-77, A-78, A-79, and B-7. In addition to the fire BMPs listed

previously, implementation of the following BMPs would be expected to minimize RCW cavity tree mortality.

- Prep RCW cavity trees before prescribed burns.
- When monitoring RCW cavity trees adjacent to these ranges, record cause of mortality.
- Replace any cavity tree damaged by fire to the point that it is unsuitable for nesting or roosting with an artificial cavity within 72 hours of the damage according to the *Eglin Air Force Base Integrated Natural Resources Management Plan Biological Opinion* from the USFWS (U.S. Air Force, 2002a).

As discussed under Alternative 1, an Eglin study looking at RCW cavity tree mortality found that mortality was twice as high in unprepared trees versus prepared trees, so the BMPs above that are focused on prescribed burning and preparing cavity trees would decrease mortality. Implementation of the general fire BMPs would decrease catastrophic wildfires on and around test areas A-77, A-78, A-79, and B-7, benefiting RCWs by decreasing the potential for hot fires that kill cavity trees. These BMPs are anticipated to decrease impacts to RCW cavity trees from wildfires. Should wildfires start at ATGG ranges, consultation with the USFWS would be necessary.

Flatwoods Salamander Habitat

Under Alternative 2, the introduction of fire BMPs would likely decrease the frequency of wildfires and increase the frequency of prescribed fire. For flatwoods salamander habitat around these test areas, the most important thing is that fire is introduced frequently, whether it is wildfire or prescribed fire; however, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. Implementation of fire BMPs would reduce potential impacts to flatwoods salamander habitat.

Florida Bog Frog Habitat

Under Alternative 2, the introduction of BMPs would likely decrease the frequency of wildfires and would increase the frequency of prescribed fire. For bog frog habitat around these test areas, the most important thing is that fire is introduced frequently, whether it is wildfire or prescribed fire; however, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. Implementation of fire BMPs would have decreased potential impacts on Florida bog frog habitat.

Potential Impacts to Sensitive Habitats

Tier I Communities, Significant Botanical Sites, and Special Natural Areas

Historically the old-growth longleaf pine resources in these areas have been negatively impacted by catastrophic wildfires, but the proposed fire BMPs, such as restricting hot missions under Class D or E levels and introducing prescribed fire on a frequent interval, will reduce the likelihood of future catastrophic wildfires. The introduction of fire BMPs will have positive

impacts on Tier I communities, significant botanical sites, and specials natural areas around these test areas.

4.5.3 Alternative 3

A 50 percent increase in ATGG activity would not likely increase the area of habitat directly impacted by munitions, but there would potentially be an increase in indirect impacts to sensitive habitat through an increase in the number of wildfires. Fire BMPs detailed under Alternative 2 should help to minimize the number of wildfires, but with an increase in munitions use, the potential for wildfires would also increase. As discussed under Alternative 1, wildfires can have both negative and positive impacts, but overall, it is preferable to minimize wildfires. An increase in wildfires would potentially lead to an increase in RCW cavity tree mortality and old-growth longleaf pine mortality, but would not likely impact flatwoods salamander or Florida bog frog habitat.

4.5.4 Alternative 4

A 100 percent increase in ATGG activity would not likely increase the area of habitat directly impacted by munitions, but there would potentially be an increase in indirect impacts to sensitive habitat through an increase in the number of wildfires. Fire BMPs detailed under Alternative 2 should help to minimize the number of wildfires, but with an increase in munitions use, the potential for wildfires would also increase. As discussed under Alternative 1, wildfires can have both negative and positive impacts, but overall, it is preferable to minimize wildfires. An increase in wildfires would potentially lead to an increase in RCW cavity tree mortality and old-growth longleaf pine mortality, but would not likely impact flatwoods salamander or Florida bog frog habitat.

4.6 DIRECT PHYSICAL IMPACTS

Live-fire operations have the potential to directly affect sensitive species and cultural resources. The potential exists for wildlife and cultural resources to be directly impacted by munitions and ground movements.

Analysis of mission activities having the potential for direct physical impacts to sensitive species and cultural resources is outlined as follows.

- Mission activities were selected to represent the typical usage of Test Areas A-77, A-78, A-79, and B-7.
- Potential impact zones associated with representative missions were identified using best available data.
- Sensitive species and areas with high probability of cultural resources within potential impact zones were identified.

4.6.1 Alternative 1 (No Action Alternative)

Potential Direct Impacts to Red-cockaded Woodpeckers from Munitions

Small arms fire will take place on test areas A-77, A-78, and B-7. Active and inactive red-cockaded woodpecker cavity trees lie within the 1 km buffer surrounding these test areas; therefore, there is potential for an RCW or RCW cavity tree along the borders of these test areas to be hit. However, this is highly unlikely given that munitions are aimed at targets within the cleared target areas, not out into the longleaf pine forest where the RCWs are found.

AAC/EMSN projects that the probability for a bullet to directly hit an RCW is low, and stray bullets have never been documented to kill an RCW or an RCW cavity tree on Eglin AFB (Hagedorn, 2003). In one instance near a test area on Eglin, a bullet was documented as protruding into the bottom of an RCW cavity with no negative impacts to the birds living in the cavity (Hagedorn, 2003). Lethal direct physical impacts to RCWs and RCW cavity trees from bullets or shrapnel are not anticipated at any of the test sites.

Potential Direct Impacts from Ground Movement

Direct physical impacts to wildlife or cultural resources from ground movements are possible on these test areas; however, most activities on these test areas involve air-to-ground gunnery. Ground activities are infrequent, and when they do occur, they are concentrated on established roads due to UXO contamination. Due to the infrequency of ground movement on these test areas, the likelihood of a direct impact to wildlife or cultural resources from troop or vehicle movement is unlikely.

Potential Direct Impacts to Cultural Resources

Portions of some test areas in this document are considered high probability zones for the presence of archaeological resources (shown previously in Table 3-9). Such regions exist on Test Areas A-78 and B-7, as well as immediately adjacent to the east and west boundaries of Test Area A-77. If activities take place only within A-77 boundaries, then no cultural concerns exist for that area. At the two other sites, AAC/EMH would like to survey before exercises begin. However, the AAC/EMH does not intend to impede missions on these test areas; AAC/EMH would survey as soon as possible as mission schedules allow.

Potential National Register-eligible sites exist on Test Area A-79. These sites must be protected until further testing can provide enough information to render a determination of eligibility. Protection would include avoidance by fencing, marking, or some other means. These measures would also be negotiated with the SHPO. AAC/EMH would provide maps indicating the locations that need to be avoided and protected.

4.6.2 Alternative 2

Implementation of the BMP calling for the use of frangible munitions would further decrease the already low potential for direct physical impacts to wildlife and cultural resources from munitions.

4.6.3 Alternative 3

The probability of striking wildlife or cultural resources would increase by an unknown amount with a 50 percent increase in ATGG activity; however, munitions are focused on hitting targets within the cleared target areas, which are essentially barren areas devoid of wildlife and cultural resources. It is extremely unlikely that munitions would directly impact any wildlife or cultural resources on the target areas if management requirements for cultural resources (detailed under Section 4.6.1, Alternative 1) are followed.

4.6.4 Alternative 4

The probability of striking wildlife or cultural resources would increase by an unknown amount with a 100 percent increase in ATGG activity; however, munitions are focused on hitting targets within the cleared target areas, which are essentially barren areas devoid of wildlife and cultural resources. It is extremely unlikely that munitions would directly impact any wildlife or cultural resources on the target areas if management requirements for cultural resources (detailed under Section 4.6.1, Alternative 1) are followed.

4.7 CHEMICAL MATERIALS

4.7.1 Alternative 1 (No Action Alternative)

Issue Description

Chemical materials as they pertain to the analysis in this document are particulate matter, gasses and other residues introduced into the environment from the expenditure of munitions, flares, chaff, smokes or leaks, spills, or exhaust from equipment, or vehicles. These materials may degrade the quality of air, soil, or water that are currently below federal or state standards or may be toxic to plants, wildlife, or people. A review of fate and transport models for chemical materials in the environment is found in the *Effector Analysis Report* (U.S. Air Force, 1997b) and summarized in Appendix F.

Ordnance

Ordnance used in testing and training missions on TAs A-77, A-78, A-79, and B-7 include the air-to-ground gunnery, bombing, and demolition training. Chaff and flare use is associated with overland test areas. An environmental analysis of flares and the operational management requirements for chaff and flares is detailed in The *Overland Air Operations Final Programmatic Environmental Assessment* (U.S. Air Force, 1998).

UXO

The potential for munition impacts with the soil resulting in the breakage or cracking of an item is not known. The density of surface and subsurface UXO may play a part in the breakage or rupturing of ordnance metal casings, as would be the case with high-velocity contact between a delivered munition and surface or subsurface objects at rest. However, once at rest, the chemistry and constituents in soil immediately begin to interact with exposed metal surfaces and

explosive material. It is generally assumed that most live ordnance has a 5 percent to 10 percent non-explosive (dud) rate. Thus, if the ordnance has cracks or breaks, the explosive material may leach into the surrounding soil.

UXO Metal Casing Corrosion

Lakeland soils that comprise the majority of the tests areas A-77, A-78, A-79, and B-7 have shown a high potential for stimulating corrosion of UXO metal casings (U.S. Air Force, 2002b). The inherent characteristics of Lakeland soil and the local climate strongly influence corrosion potentials. The soils are strongly acidic (pH 4.0 to 5.0), which tends to promote corrosion, oxidation, and surface weathering. The course sand texture also facilitates the formation of large spaces between soil particles, which can cause oxidation of metals. The high rainfall (mean annual precipitation of 60 inches per year) and subtropical temperatures that characterize the test areas enhance metal degradation rates compared to cooler climates (U.S. Air Force, 2002b). However, it has been shown that it could potentially take up to 200 years for pitting corrosion to perforate a metal casing one-half inch thick in sandy acidic soils of TAs A-77, A-78, A-79, and B-7. Thus, metal casing corrosion, although active on the test areas, is expected to be limited and non-impactive to soils. The potential presence of cracked or damaged UXO materials that were perforated as a result of impact is a more likely source of UXO contamination (U.S. Air Force, 2002b).

Impacts to Soil Quality

For the purpose of chemical materials analysis, the maximum expendable use for FY98 through FY00 was determined. Chemical constituents chosen for assessment were based on the following criteria.

- Chemical constituents in munitions that are carcinogenic.
- Chemical constituents have greater than or equal to 1 pound of total usage (soil input) on test area annually. The 1-pound limit is based on EPCRA-TRI-DDS reporting.
- Chemicals constituents are mobile in soils and are readily bioavailable based on published fate/transport data/information.

Soil modeling was conducted to estimate the amount of metals and explosives that would result from the use of standard munitions over time. The Seasonal Soil Compartment Model (SESOIL) was used for this analysis and is a one-dimensional vertical transport integrated screening-level soil compartment tool. The model utilizes site-specific soil, chemical, and meteorological values as input to obtain chemical concentrations. SESOIL can estimate the rate of migration of chemicals through soils and the concentration of the chemical in soil layers following chemical loading that is instantaneous or continuous.

The criteria used to determine potential impacts as indicated by modeling results were contaminant thresholds or benchmarks identified by the federal government for screening or identifying areas where the potential for contamination exists. Tier I-III values for contaminants of potential concern (COPCs) for environmental investigations at Eglin are also listed in

Table 4-22. These values are used for screening and background purposes only, and are not intended for use as actual cleanup goals.

More specifically, the USEPA uses these ecological screening benchmarks to identify chemical concentrations in environmental media that are associated with a low probability of unacceptable risk to ecological receptors. The Environmental Sciences Division of Oak Ridge National Laboratory (ORNL) developed a comprehensive assembly of screening values, which are presented in Table 4-22 together with values developed by regulatory agencies for constituents of concern. The benchmarks are based on conservative endpoints and sensitive ecological effects data and represent a preliminary screening of site contaminant levels to determine if there is a need to conduct further investigations at sites and are not meant to be used as clean up levels. Exceedances of the ecological screening values may indicate the need for further evaluation of the potential ecological risks posed in the area. USEPA Region III Risk Based Concentrations are values used to show the potential risk to human health of residential inhabitants from exposure to levels above criteria. Table 4-22 also lists background soil concentrations (Tier II SSLs) of metals.

Table 4-22. Ecological Benchmark Values and Soil Screening Criteria for Munitions Constituents

	USEPA Region IV Ecological Soil Screening Benchmark[1]	USEPA Region III Risk Based Concentration (Industrial)[2]	Tier I Soil Screening Levels[3]	Tier II Soil Screening Levels (Background Concentrations) for Surface Soils[3]	Tier III Soil Screening Levels[3]
	mg/kg				
Chromium	0.4	3,100	210	7.16	23
Copper	40	41,000	110	8.84	310
Lead	50	400	400	39.64	40
RDX	ND	26	5.8	ND	ND
TNT	ND	95	21	ND	230
Zinc	50	310,000	23,000	35.42	2300

1. Oak Ridge National Laboratory (ORNL), 2003.
2. USEPA, 2003 (Region III Risk Based Concentration Table, 4/25/2003)
3. U.S. Air Force, 2000 (Guidelines for Chemicals of Potential Concern (COPC) Identification, Revision 3)
ND = No Data

SESOIL models were run following two scenarios:

1) Ordnance would fall anywhere within the test area boundary; surface area = total test area.
2) Ordnance would fall near targets; surface area = targets plus 50 foot buffer.

Modeling of contaminant loading was for five continuous years.

The assumption used for SESOIL modeling was that the constituents in the ordnance were immediately available (i.e., free to move through the environment) once expended. In reality some passing of time would occur before constituents would be available, but this scenario presents a useful concentration to compare to the established screening criteria in lieu of actual site-specific sampling data. Results of SESOIL modeling are located in Table 4-23. Exceedances in criteria are denoted in bold.

Table 4-23. SESOIL Modeling Results of Baseline Munitions Composition Constituents in Soil*

		A-77	A-78	A-79	B-7
Overall Test Area					
	Maximum Contaminant Migration Depth (m) in Lakeland Soil	**Surface Area = 13,900,000 m^2**	**Surface Area = 16,400,000 m^2**	**Surface Area = 216,000 m^2**	**Surface Area = 12,800,000 m^2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	0.30	0.10	<0.0001	0.20
Copper	0.05	**255**	**125**	<0.0001	**109**[1]
Lead	0.02	19	12	<0.0001	1.30
RDX	2.11	0.10	0.10	<0.0001	0.11
TNT	0.19	4.60	3.30	7.20	20
Zinc	0.03	**139**	9.50	<0.0001	30
		A-77	**A-78**	**A-79**	**B-7**
Targets with 50 foot buffer					
	Maximum Depth (m)	**Surface Area = 1,900,000 m2**	**Surface Area = 1,340,000 m2**	**Surface Area = 31,000 m2**	**Surface Area = 1,220,000 m2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	2.40	1.80	<0.0001	2.35
Copper	0.05	1,865	1,528	<0.0001	1,144
Lead	0.02	143	153	<0.0001	14
RDX	2.11	1.12	1.26	<0.0001	1.17
TNT	0.19	33	37	40	23
Zinc	0.03	431	491	<0.0001	136

*Assumes constituents are immediately dispersed and available for transport
[1] Copper in the environment on B-7 is introduced via .50 caliber weapons.

SESOIL modeling results of the baseline ordnance expended over the entire surface area showed that over a five-year loading period, background and ecological soil screening levels (SSLs) would be exceeded for copper at TAs A-77, A-78, and B-7 and zinc at TAs A-77 and A-78. The ecological SSL is exceeded at A-77 for chromium. Modeled constituent concentrations of all ordnance at target areas (with a 50-foot buffer) exceeded background and SSLs at TAs A-77, A-78, and A-79 with the exception of RDX. At TA B-7, only TNT exceeded soil-screening criteria and all other constituents remained below detection (<0.0001 mg/kg).

It is recommended that if lead bullets are expended and UXO is not cleared annually, periodic soil monitoring for relevant metals and/or explosives should continue as is currently established and documented by AAC/EMR. Additionally the use of non-lead ("green") munitions in place of lead containing rounds use as described in best management practices outlined in Appendix B and Appendix E could negate potential impacts from munitions residue in soil. The *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) outlines procedures to be followed to reduce potential impacts from ordnance. As long as BMPs are implemented, the chemical materials impacts to soil may be reduced and increased range sustainability would ensue.

Environmental Fate of Munitions Residue

Once released into the environment, the fate and transport of chemicals through water and soil are complex phenomena. Organic molecules from explosives formulations or explosive detonations interact with soil components and soil water, move through the soil by diffusion and advection, change from vapor state, are dissolved in soil water, and are sorbed on stationary soil solid phases. The molecules are chemically transformed by microorganisms and soil minerals. Metals released to the soil would typically be much less mobile in the environment. Movement of metals into other environmental compartments (i.e., groundwater, surface water, or the atmosphere) is expected to be minimal as long as the retention capacity of the soil is not exceeded. The extent of movement of a metal in the soil system is intimately related to the solution and surface chemistry of the soil and to the specific properties of the metal and associated waste matrix. Changes in the chemical environment (especially pH and reduction/oxidation conditions) may result in very different relative chemical mobility for the components; acidic and/or reducing conditions may increase dramatically the mobility of the metals in the environment. Environmental fate and transport characteristics of chemicals common to munitions or munition residues are presented in Appendix F.

The primary release mechanisms are residues that are associated with the successful detonation of munition items or residues associated with the breakup of UXO, either at impact or due to subsequent corrosion. Both of these mechanisms would result in release of metallic and organic compounds to the ground. Additionally, the detonation process would release a variety of organic, inorganic, and metallic compounds to the air as gases, vapors, or particulates.

Depending on the medium and chemical released, migration of contaminants would be through percolation of liquid into shallow groundwater or runoff that carries contaminated particles into surface water. Contaminant soil transport would only be significant if soils were transported off-site. Surface water has the potential to be impacted by overland flow crossing test areas and picking up contaminants that are transported to streams. Shallow groundwater could be impacted if explosives or their metabolites were transported from soils to groundwater. Potential receptors of munition residue include on-site personnel, recreational users/trespassers, adjacent residents, and aquatic and terrestrial biota.

Toxicity Assessment of Munition Residue

A toxicity assessment examines the toxicity (harmfulness) of chemicals by comparing chemical concentrations with established criteria for cancerous and noncancerous health effects. For chemicals known to cause cancer, <u>any</u> exposure is thought to be able to cause cancer. The likelihood of cancer resulting from exposure to a chemical is expressed a probability (such as “a 1 in 1 million chance”). For noncancer adverse effects, low exposures may not cause harm, and corresponding threshold values have been developed. Exposures below the threshold value are considered safe, and values above the threshold are considered harmful.

Human and ecological effects of munition and UXO residue is dependent upon both the availability and the concentration in the environment of the contaminant that is either inhaled, absorbed, or ingested by the receiving organism. Some contaminants, such as lead, can cause

adverse effects to humans and biota at very small exposure concentrations. The effects vary between chemical contaminants, routes of exposure, and the organisms that are exposed.

Table F-1, Toxicity Assessment of Ordnance, in Appendix F provides a summary of the potential adverse effects and carcinogenicity class from exposure to common munition residues or chemicals. Two of the organics listed in the table (RDX and TNT) and two of the metals (lead and zinc) have been identified as possible carcinogens.

Potential Impacts to Groundwater and Surface Water Quality

Potential Water Quality Impacts from Munitions

Live and inert small arms, guns, bombs, and flares would be primarily expended on A-77, A-78, and B-7; the potential exists for contaminants to be carried to groundwater and surface waters. The transport of metals and explosives through the soil column depends upon many physical and chemical properties of the metals, the soil, and climate.

Groundwater

The SESOIL model showed that RDX had the greatest potential for contaminant migration through the soil compartments and may be transported to a depth of less than 2 meters (approximately 6.5 ft) (Table 4-22). Modeling results revealed that all metals would be retained in the top 3 inches of the surface soil. However, modeling did not take into account the propensity for air-to-ground gunnery ordnance to penetrate the surface soil. The penetration resistance of Lakeland soils may result in the penetration and lodging of bombs and projectiles in lower layers of the soil profile (U.S. Air Force, 2002b). The bomb or projectile vertical velocity, angle of repose at the point of ground impact, and munition features and delivery mechanism also influence whether the item becomes buried or remains on the surface which may impact contaminant migration to groundwater.

Surface Water

Lead comprises a large portion of traditional small arms ammunition. Many bullets will be expended on the range. However, most lead is retained strongly in soils and only very small amounts move into surface waters (USEPA, 1986; NSF, 1977). The potential exists for lead to migrate into surface waters from erosion of soil that contains this particulate metal (ATSDR, 2002). However, due to the large distance from target areas to surface waters and the fact that soil strongly binds lead, surface water quality degradation by lead is not anticipated.

Cartridge brass by composition is 70 percent copper and 30 percent zinc, and corrosion of the elements, though slow, would occur over time. The primary interaction between the brass alloy and the environment would occur at the sediment-water interface, potentially affecting those organisms that live in the sediments. Due to the distance between target areas and surface waters and the densely vegetated state of the areas surrounding surface waters, concentrations of copper and zinc would not be expected to reach levels of concern in surface waters because they would be treated and absorbed by vegetation before reaching the water. Runoff from cartridge brass is not anticipated to impact surface water quality.

Potential Water Quality Impacts from Chaff

Aluminum deposited on the soils and in surface water from the deployment of chaff is not in the chemical form required for environmental transport (U.S. Air Force, 1996a). In studies on the fate and transport of chaff constituents (Munk, 1994), chaff was shown to be relatively stable under neutral and alkaline conditions, while acidic conditions increased leachability; that is, chaff may remain as it falls, or it may dissolve or leach into the soil, depending on the type of soil and/or water it falls on. The physical form of the aluminum in chaff, the dipoles, makes it more difficult for chaff to move in soil and makes it even more difficult to dissolve or leach; however, the chaff can settle out of surface water and be deposited in sediments. Metallic aluminum (Al) is susceptible to surface oxidation, which converts the surface to an oxide; the oxide may or may not dissolve depending, again, on the type of soil or water it falls on (U.S. Air Force, 1997a).

Aluminum associated with soil particles can be transported into surface water by erosion and can be transported as suspended particulate matter. In aquatic environments, Al^{+3} (trivalent) forms aluminum hydroxide, $Al(OH)_3$, which is insoluble and precipitates out of solution. Conditions found in most natural bodies of water are indicative of causing aluminum to precipitate or to be absorbed and locked away in bottom sediments.

Depending on mitigating environmental factors (i.e., wave action, flow rates), chaff deposited in surface water may float or accumulate on the water's surface, sink and become deposited in sediments, or dissolve. Visual surveys at the Nellis and Townsend Land Ranges after the use of chaff found no accumulation on surface waters other than that which had been dropped within the past 24 hours (U.S. Air Force, 1999). This would indicate that chaff begins to sink or break down. As stated earlier, acidic conditions tend to enhance the breakdown of aluminum.

Potential Water Quality Impacts from Flares

No National Ambient Water Quality Criteria (NAWQC) has been assessed for magnesium in surface waters and no limit for magnesium has been established for surface waters used for recreation, propagation, and maintenance of a healthy, well-balanced fish population (Florida Administrative Code (FAC) 62-302.530). There is no federal or state Maximum Concentration Level (MCL) for magnesium in drinking water. Surface water would be exposed to extremely small amounts of magnesium from flares. These concentrations are too low to affect either the solution chemistry or pH of the surface waters. Therefore, no adverse effect from the use of flares on surface water quality is expected.

Potential Water Quality Impacts from M-18 Grenades

Dyes used in smoke grenades have limited solubility, which means that only a small amount of the dye will dissolve in water and the rest will remain as solid particles. The solubility of Solvent Yellow 33 ranges from 0.089 mg/L (89 parts per billion) at a temperature of 12°C to 0.18 mg/L (180 parts per billion) at 22°C, a range of concentrations not acutely lethal to fish or aquatic invertebrates (Davidson and Horvatter, 1987). However, algal growth was significantly affected at solubility limits of 0.20 mg/L. The low solubility of the dyes means that residence in the water column would be short with the dyes ending up in the sediments. Smoke grenade dyes may temporarily affect water quality if used near water, but would have no lasting or significant effects due to quick dispersal of materials in the water column.

Potential Water Quality Impacts from RED HORSE Detonations

Test Area A-79 does not have any active targets, but the clay pit located in the southwest corner of this site is used for RED HORSE demolition training. This area is confined; therefore, the chemical materials expended are expected to be held within the pit. Containment of explosive munition deposition within structures drastically reduces the potential for residues to migrate to water bodies. Based on environmental fate and bioconcentration data, it is not anticipated that impacts to water quality would occur from explosives residue. Panther Creek, the nearest waterbody, is over 900 feet from the site. Chemicals from RED HORSE exercises are not expected to migrate from the pit into this waterbody.

Potential Impacts to Wildlife

Potential Impacts to Wildlife from Munitions

Metallic components of certain munitions can be toxic to wildlife. Wildlife can be exposed to contaminants through multiple pathways; they may drink or swim in contaminated water, ingest contaminated soil and food, or breathe contaminated air. Animals may move between habitats incurring contamination from several spatially discrete sources. The exposure pathway most likely to occur would be regular ingestion of plants or soil invertebrates growing or living near target areas.

Cattle, sheep, and swine studies identified soil as the main sources of exposure to contaminants, including lead. Soil may be ingested intentionally or incidentally. Wildlife may intentionally feed on soil and grit to supplement mineral deficiencies and/or to assist in food digestion. Seed-eating birds may ingest soil as a digestion aid. Box turtles, tortoises, and other reptiles are known to intentionally consume soil, possibly for its mineral content (Arthur and Alldredge, 1979). Animals can incidentally ingest soil while grooming, digging, grazing, and feeding on soil-covered roots or food sources such as mollusks that contain sediment. Some birds gather mud in their beaks for nest building. Wood ducks can ingest high rates of sediment while feeding (USEPA, 1993). Animals that feed extensively on earthworms may have an increased exposure potential because worms ingest soil directly. Earthworms are typically 20 to 30 percent soil. Estimated soil ingestion rates for several species are presented in Table 4-24.

Table 4-24. Estimated Soil and Sediment in Terrestrial Species Diets

Species	Percent Soil in Diet (dry weight)	Rate of Soil Consumption/Food Consumption (kg/d)
BIRDS		
Wild turkey	9.3	0.0162/0.174
Wood duck	11.0	ND
Shorebirds	10–60	
MAMMALS		
White-tailed deer	<2.0	0.0348
Red fox	2.8	0.0126/0.45
White-footed mouse	<2.0	0.000068/0.0034
Eastern cottontail	6.3	0.015/0.237
REPTILES		
Eastern painted turtle	5.9	ND
Box turtle	4.5	

Sources: USEPA, 1993; Sample and Suter, 1994
ND = no data; kg/d = kilograms per day

Live firing of standard munitions poses a risk of exposure from various metal alloys to certain species of wildlife, particularly those that feed in close contact with the soil and sediments such as some insects, birds, and wild hogs. The adverse environmental impacts of lead in shooting rounds are well documented. A study by Stansley et al. (1997) showed that lead shot accumulates in soil and sediment that surrounds trap and skeet range. Effects in small mammals include elevated blood-lead levels, increased kidney to body weight ratios, and depressed hemoglobin concentrations. Waters impacted from a trap and skeet range were toxic to *Rana palustris* tadpoles.

Effects to frogs include inhibited growth and development (Power et al., 1989), limb malformations, and death (Stansley et al., 1997). If concentrations of spent lead shot are high, aquatic organisms can be easily exposed to toxic shallow surface waters. Waterfowl and birds may also be impacted by training events. Target areas on test areas A-77, A-78, A-79, and B-7 are located at least 520 feet from the nearest surface water body and dense vegetation surrounds the water bodies on and near these test areas. Given the distance from target areas and the lead absorption potential of the interceding vegetation, no impacts to aquatic species from lead runoff are anticipated.

Birds are particularly vulnerable to lead accumulation because spent shot often lies within the top 3 cm of the soil and many birds feed on organisms in topsoil. Research has shown that lead contamination increases mortality and reduces breeding success. Studies have shown that lead produces anorexia, ataxia, loss of weight, weakness, lethargy, excitement, coma, and quiet death in waterfowl. Egg production, fertility, and hatchability decreases while mortality increases. Lead pollution has even created high levels of mortality in bald eagles and California condors (Pattee and Hennes, 1983; Wiemeyer et al., 1988). Predators of these birds may also be exposed from consuming contaminated carcasses. Bottom-feeders including waterfowl are not present in the area because standing water does not occur on the test areas for ATGG activities.

Potential Impacts to Wildlife from Chaff

Potential effects on wildlife from the use of chaff are inhalation of chaff fibers, ingestion of chaff fibers, ingestion or contact with the chemical constituents of chaff, and concussion from falling debris. A study conducted by the Air Force (U.S. Air Force, 1995a) showed that chaff dipoles do not break down smaller than PM_{10}, which is the particulate criterion for inhalation. In the event that airborne chaff fibers are encountered by an animal they would not be inhaled due to the length of the dipoles, and would be ejected (U.S. Air Force, 1997). As a result, no adverse effects to wildlife are expected from the inhalation of chaff fibers. Studies designed to determine the toxicity associated with direct ingestion of chaff have concluded that chaff presents no health hazards to farm animals or toxic effects on aquatic organisms.

Proximity exposure to chaff dipoles may be an irritant when fibers are in large quantities. This could occur if animals acquire large amounts of chaff fibers in their nesting materials. Proximity exposure was studied by the U.S. Air Force on the Nellis and Townsend Land Ranges, where chaff has been used heavily for many years. Results indicated no evidence of chaff fibers in the nesting materials of birds or rodents that were examined (U.S. Air Force, 1997). Based on the study mentioned above, no detrimental effects from proximity exposure to birds and rodents due to chaff fibers being used as nesting material are expected.

Toxicity thresholds are those levels at which exposure to chemicals or elements would cause detrimental effects to biological systems. Toxicity thresholds in soils, surface water, groundwater, and sediments can be determined either by estimating the hazards from exposure to those media or by reference to an agency's standards. Target concentration limits are hazard-based concentration limits for soil – the National Ambient Water Quality Criteria (NAWQC) for surface water, and the Maximum Concentration Level (MCL) for groundwater (U.S. Air Force, 1997b). The Toxicity Reference Value (TRV) is used as a reference value for toxicity levels for biological systems. It is calculated by using allometric (growth) correction factors for size and metabolic rate of the receptor (Opresko et al., 1995). Toxicity of aluminum varies among receptors, but is generally typical of metal ions. Aluminum toxicity results from the uptake of Al^{+3}, meaning that toxic exposures would only occur in conditions resulting from the production of soluble Al^{+3}. The secondary MCL for aluminum in groundwater is 0.2 mg/L. The chronic NAWQC for Al^{+3} is 87 mg/L. Table 4-25 summarizes toxicity thresholds for various receptors.

Ingestion of chaff fibers may occur inadvertently due to the mixing of the dipoles with vegetative matter, soil, or other feeding matter (U.S. Air Force, 1997a). Aluminum materials deposited in soils may be contacted directly or be ingested by those animals that ingest soil as they feed. Animals may also ingest aluminum materials by eating plants that have taken it up through their roots. Therefore, the potential exists for bioaccumulation of aluminum materials through the food chain as animals eat plants or other animals that have acquired aluminum materials. Potential receptors are earthworms, small herbivorous, insectivorous, and omnivorous mammals, and birds that feed on insects and earthworms (U.S. Air Force, 1999). Because earthworms consume large amounts of soil, animals such as birds and small mammals that consume large quantities of earthworms are the most at risk for exposure, and therefore tolerate the lowest concentrations of available aluminum in soil. Raptors and other predators may be exposed through consumption of animals that have bioconcentrated contaminants.

Table 4-25. Toxic Effects and Concentrations of Aluminum (Al^{+3})

Receptor	Toxic Effects	TRV	Reference
Plants	Decreases respiration and uptake of essential nutrients, interferes with cell division.	50 mg/kg soil	Will and Suter, 1995
Earthworms	No toxicity data available for aluminum.	No toxicity data available for aluminum.	Will and Suter, 1995a
Small mammals (e.g., short-tailed shrew)	Dermal contact with aluminum and aluminum oxide (Al_2O_3) powder may cause skin necrosis; inhalation may cause pneumoconiosis. In toxicity studies, chronic dietary ingestion caused decreased growth of mouse offspring.	LOAEL = 23 mg/kg/day	Opresko et al., 1995
Birds (e.g., American Robin)	Chronic dietary intake caused decreased reproduction by chickens.	LOAEL = 44.5 mg/kg/day	Opresko et al., 1995

TRV = Toxicity reference value, calculated by using allometric correction factors for size and metabolic rate of the receptor (Opresko et al., 1995).
LOAEL = Lowest observed adverse effects level.

A number of studies have been conducted on the effect of chaff ingestion by farm animals. Because the animals avoided the ingestion of chaff by itself, the studies mixed chaff with feed materials that were then ingested by cattle and goats. No differences in weight or development were observed, and no abnormalities in the digestive tract were found after postmortem (U.S. Air Force, 1997c). The study using goats is particularly relevant because goats are similar to deer in browsing habitats and physiology. These studies concluded that ingestion of chaff did not present a hazard to farm animals. Ingestion of chaff is not likely to occur because concentrations at ground level are quite low, and chaff is chemically nontoxic (U.S. Air Force, 1999).

Potential Impacts to Wildlife from Flares

Mechanisms of toxicity vary among ecological receptors and depend on availability. Toxicity reference values (TRVs) are derived from the experimental No Observable Adverse Effects Level (NOAEL) and Lowest Observable Adverse Effects Level (LOAEL). While a review of the literature revealed no threshold levels for magnesium regarding plants and wildlife, tests have been conducted on plants, mice, and fish in order to determine the effects of flare residue on biological systems. The residue was mostly MgO, and was approximately 60 percent total magnesium. Mice exposed to flare residue in their drinking water (2,500 mg/L) and by direct contact showed no signs of toxic effects.

Potential effects on wildlife from the use of flares are inhalation of flare ash and ingestion of or contact with the chemical constituents of flares. Because concentrations of airborne flare ash would be minimal, with particles being widely dispersed due to wind and other environmental factors before reaching ground level, there is no potential for adverse effects related to the inhalation of flare ash to wildlife.

The toxic effects of flare ash residue were tested on mammals, plants, and fish with concentrations of flare ash representing the high range that would be found in a pyrotechnic test area. Results indicated that the effects of flare ash residue are very minimal and not particularly dangerous to the environment (U.S. Air Force, 1997). The resultant addition of chemical constituents to soils is not of sufficient quantities to raise background levels substantially. For this reason it is assumed that there would be no potentially adverse effects from the inadvertent digestion of flare ash or its chemical constituents. Animals in direct contact with large quantities of flare ash could experience skin irritation.

Resultant concentrations of flare ash and residue added to the environment from the use of flares over the ATGG test areas should pose no threat to sensitive species. The resultant addition of chemical constituents of flares is not of sufficient quantities to change soil, water, or air chemistry. None of the threatened or endangered species are known to be especially sensitive to the chemical constituents of flares. As a result, sensitive species should not be adversely affected from the use of flares.

Potential Impacts to Wildlife from M-18 Grenades

Wildlife would be potentially exposed to dye-colored smoke through inhalation, ingestion, direct contact, and bioconcentration. The most likely opportunity for such exposure would be immediately after the smoke has been dispelled, but since wildlife would most likely leave the area during training exercises, direct exposure to toxic levels of emissions is not anticipated. Once released, smoke grenade dyes could persist in the environment for a time, eventually settling out on water or land. Ingestion or inhalation of particles in sufficient amounts to cause harm is unlikely due to the wind driven distribution of smoke particles. However, since dye compounds do persist in the environment, bioconcentration of dye particles in the tissues of animals is a possibility.

Guidelines established by the USFWS indicate that the use of smokes and flares within 200 feet of red-cockaded woodpecker (RCW) cavity trees would not adversely affect this species (U.S. Army, 1996; USFWS, 1996). Impacts to RCWs and other wildlife on the test areas are not anticipated from smokes.

4.7.2 Alternative 2

Impacts to Soil Quality

SESOIL modeling results are the same as Alternative 1 and are located in Table 4-22. Potential impacts to soil quality could be reduced by implementation of range sustainability practices and procedures outlined in Eglin Range UXO and Residue Strategic Plan (U.S. Air Force, 2001) that include the following.

- Bullet containment
- Implementation of sampling plans to monitor for the presence of metals and explosive in soil that could potentially migrate to groundwater
- Inhibited migration strategies
- Modification in munitions (green munitions)
- Increased level of range clean up

A detailed discussion of these range sustainability practices can be found in Appendix E.

Potential Surface Water Quality Impacts

Impacts on surface water quality from chemical materials under Alternative 2 would potentially be reduced versus Alternative 1. Munitions range sustainability BMPs would involve containment of and/or periodic removal of metal by-products. Specific BMPs include and are detailed in Appendix B and Appendix E.

- Use of bullet containment methods and lead-based projectiles management

- Determine the potential for the migration of metals
- Runoff control through the use of vegetative ground cover, mulches and compost, surface covers, and engineered runoff controls
- Use of munitions composed of non-lead alloys, when possible
- Recovery of munition casings from streams, wetland areas, and interior objectives, when possible
- Recovery of approximately 60 percent of the brass casings expended during ATGG training

Use of the BMPs above would serve to reduce the potential for runoff from munitions and pyrotechnics to impact surface water quality. Impacts to surface water quality from munitions and pyrotechnics are not anticipated.

Potential Impacts to Wildlife

Munitions BMPs that would reduce the impact from chemical materials on wildlife include:

- Employment of frangible munitions, when possible.
- Employment of non-lead munitions, when possible.
- Recovery of munition casings from streams, wetland areas, and interior objectives, when possible.
- Recovery of approximately 60 percent of the brass casings expended during ATGG training.
- Avoidance of deposition of casings and other materials into sensitive species' habitats.

There are three types of ammunition analyzed in this section: lead projectile munitions, frangible munitions, and "green" munitions with non-lead projectiles. Frangible munitions are of non-lead composition and of limited range, whereas green munitions have the same performance characteristics as standard lead ammunition. Frangible munitions were developed to break apart when hitting hard surfaces, thereby preventing the incidence of ricochets during close-quarter combat. Frangible bullets are not made from a lead projectile covered with a copper jacket but rather are composites of hybrid materials pressed together with adhesives. Although the fragments from the bullets may corrode faster in the environment, potentially becoming more readily available to aquatic organisms than larger-fragment projectiles, the constituents are not as hazardous as lead.

Oak Ridge National Laboratory (ORNL) developed a nontoxic, all-metal replacement for lead in bullets. The frangible bullets are fabricated from mixtures of tungsten-tin. ORNL's Industrial Hygiene Department determined that the metals and alloys in the projectile material for the bullets are environmentally safe (ORNL, 2003). Still, modeling indicates that tin levels in soil

could increase near target areas to levels identified by USEPA as screening levels, requiring further analysis and monitoring.

Lead-free “green” bullets have been developed to replace copper-jacketed bullets. The bullets are produced with tungsten-tin or tungsten-nylon cores instead of lead. Depending on the composition, shape, size and amount of heat treatment, the bullets may be frangible, as described above, or penetrating. Tungsten and tin do not have any known toxic characteristics when used as green bullets (Bogard et al., 1999). Tungsten, a nontoxic metal more dense than lead, and tin, used extensively in food and beverage containers, are now used in the projectile slugs, resulting in ballistic performance equivalent to that of lead slugs but without the environmental impacts. Additionally, tungsten and tin are specified by federal law, 50 CFR, 1997, as nontoxic for use in shot for hunting migratory waterfowl. Also, these metals are not designated by USEPA as hazardous waste constituents and have no applicable federal land disposal restrictions (Bogard et al., 1999).

The environmental stability, mobility, and biological uptake of tungsten from bullets made of tungsten-nylon and tungsten-tin were studied by ORNL. Concentrations of tungsten in leachate from experiments using sand showed the greatest mobility of tungsten. Outdoor exposures and accelerated aging tests studied the stability of materials. Data showed that tungsten powder oxidizes to form tungsten oxides, which is insoluble in water and fairly stable in the environment. Biological uptake revealed that earthworms were not adversely affected by exposure to soil contaminated with the tungsten-containing bullets; the uptake of tungsten by the earthworms was minimal to zero (Lowden, 2003).

Although lead-replacement metals such as tungsten and tin are considered to be less environmentally impactive than lead (Bogard et al., 1999), studies on the chemical fate and transport of all frangible munitions composite materials (i.e., copper, zinc) are lacking. Of concern is the predisposition of frangible munitions to break apart into tiny fragments, which may become more readily bioavailable to terrestrial and aquatic biota.

Use of frangible and non-lead munitions is recommended to reduce impacts to wildlife. Where possible, deposition of casings and other materials into sensitive species habitats, such as those for the RCW and bog frog, should be avoided. With BMPs in place and the majority of the projectile components removed, minimal exposure of wildlife to metals is expected. However, as a conservative measure, sensitive species habitats should be avoided.

4.7.3 Alternative 3

Impacts to Soil Quality

SESOIL modeling results for Alternative 3 are located in Table 4-26.

Table 4-26. SESOIL Modeling Results of Munitions Composition Constituents in Soil-Alternative 3

		A-77	**A-78**	**A-79**	**B-7**
Overall Test Area					
	Maximum Contaminant Migration Depth (m) in Lakeland Soil	**Surface Area = 13,900,000 m2**	**Surface Area = 16,400,000 m2**	**Surface Area = 216,000 m2**	**Surface Area = 12,800,000 m2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	0.45	0.15	<0.0001	0.30
Copper	0.05	383	188	<0.0001	164
Lead	0.02	29	18	<0.0001	1.95
RDX	2.11	0.15	0.16	<0.0001	0.168
TNT	0.19	6.9	4.95	11	30
Zinc	0.03	209	14	<0.0001	46
		A-77	**A-78**	**A-79**	**B-7**
Targets with 50 foot buffer					
	Maximum Depth (m)	**Surface Area = 1,900,000 m2**	**Surface Area = 1,340,000 m2**	**Surface Area = 31,000 m2**	**Surface Area = 1,220,000 m2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	**3.6**	**2.7**	<0.0001	**3.5**
Copper	0.05	**2,798**	**2,292**	<0.0001	**1,716**
Lead	0.02	**214**	**230**	<0.0001	21
RDX	2.11	1.68	1.89	<0.0001	1.76
TNT	0.19	**50**	**56**	**60**	**35**
Zinc	0.03	**647**	**737**	<0.0001	**204**

*Assumes constituents are immediately dispersed and available for transport

SESOIL modeling results of the baseline ordnance expended over the entire surface area showed that over a five-year period background, Tier I, and soil screening levels (SSLs) would be exceeded for copper at TAs A-77, A-78, and B-7. Ecological SSLs and background concentrations for zinc at TAs A-77 and A-78 would be exceeded. TNT and zinc were shown to exceed Tier I screening levels at B-7. Modeled constituent concentrations of all ordnance at the target areas with a 50-foot buffer exceeded SSLs for both metals and explosives at TAs A-77, A-78, and B-7 with the exception of TA A-79, which only showed exceedance for TNT SSLs. All other constituents at TA A-79 remained below detection (<0.0001 mg/kg). Potential impacts to soil quality could be reduced by implementation of range sustainability practices outlined in the Eglin Range UXO and Residue Strategic Plan (U.S. Air Force, 2001) and as detailed in Appendix E.

Potential Surface Water and Groundwater Quality Impacts

The potential for impacts to surface water quality from munitions, chaff, and flares would increase under this alternative, but it is still unlikely given the distance between target areas and water bodies. SESOIL modeling results showed that RDX has the greatest potential to migrate to groundwater; however, the concentrations of RDX in soil did not exceed SSLs. The potential for chemical impacts to wildlife from munitions, chaff, and flares would increase under Alternative 3, but with implementation of the BMPs outlined under Alternative 2, the potential would still be below levels of concern.

4.7.4 Alternative 4

Impacts to Soil Quality

SESOIL modeling results for Alternative 4 are located in Table 4-27.

Table 4-27. SESOIL Modeling Results of Munitions Composition Constituents in Soil-Alternative 4

		A-77	A-78	A-79	B-7
Overall Test Area		**100 Percent Increase**			
	Maximum Contaminant Migration Depth (m) in Lakeland Soil	**Surface Area = 13,900,000 m2**	**Surface Area = 16,400,000 m2**	**Surface Area = 216,000 m2**	**Surface Area = 12,800,000 m2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	0.60	0.2	<0.001	0.40
Copper	0.05	510	250	<0.0001	218
Lead	0.02	38	24	<0.0001	2.60
RDX	2.11	0.20	0.21	<0.0001	0.22
TNT	0.19	9.2	6.60	14	40
Zinc	0.03	278	19	<0.0001	61
		A-77	**A-78**	**A-79**	**B-7**
Targets with 50 foot buffer					
	Maximum Depth (m)	**Surface Area = 1,900,000 m2**	**Surface Area = 1,340,000 m2**	**Surface Area = 31,000 m2**	**Surface Area = 1,220,000 m2**
		Concentration in Soil (mg/kg)	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**	**Concentration in Soil (mg/kg)**
Constituent					
Chromium	0.08	4.8	3.6	<0.0001	4.7
Copper	0.05	3,730	3,056	<0.0001	2,288
Lead	0.02	285	306	<0.0001	29
RDX	2.11	2.24	2.52	<0.0001	2.34
TNT	0.19	67	75	81	46
Zinc	0.03	862	982	<0.0001	272

*Assumes constituents are immediately dispersed and available for transport

SESOIL modeling results of the baseline ordnance expended over the entire surface area showed that over a five-year period background and soil screening levels (SSLs) would be exceeded for chromium (TA A-77), copper (TAs A-77, A-78, and B-7), and zinc (TAs A-77 and B-7). SSLs for TNT were exceeded at TA B-7. Modeled constituent concentrations of all ordnance at the target areas with a 50-foot buffer exceeded SSLs for both metals and TNT at TAs A-77, A-78, and B-7, with the exception of TA A-79, which only showed exceedance to TNT SSLs. All other constituents at TA A-79 remained below detection (<0.0001 mg/kg). Potential impacts to soil quality could be reduced by implementation of range sustainability practices outlined in the *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) and as detailed in Appendix E.

Potential Surface Water and Groundwater Quality Impacts

The potential for impacts to surface water quality from munitions, chaff, and flares would increase under this alternative, but it is still unlikely given the distance between target areas and water bodies. SESOIL modeling results showed that RDX has the greatest potential to migrate to groundwater; however, the concentrations of RDX in soil did not exceed SSLs. The potential for chemical impacts to wildlife from munitions, chaff, and flares would increase under

Alternative 4, but with implementation of the BMPs outlined under Alternative 2, the potential would still be below levels of concern.

4.8 AIR QUALITY

4.8.1 Alternative 1 (No Action Alternative)

Combustion products and fugitive dust from munitions detonation activities would be generated from missions on TAs A-77, A-78, A-79, and B-7 and within the overlying airspace. Analysis considers the amount of combustive emissions and uncontrolled fugitive dust associated with ground-based emissions (e.g., from munitions detonations), and exhaust emissions from aircraft.

Project generated air emissions were analyzed to determine if:

- Emissions contributed to an existing or projected air quality violation.
- There was an increase of 10 percent or more in Okaloosa and Santa Rosa Counties' individual criteria pollutants emissions.
- A permit to operate was required.
- A change to the Title V permit was required.

Appendix J provides the methods and details for analysis of air quality impacts from aircraft emissions and ground-based activities, including a comparative overview between emissions from each category and the total emissions produced at Eglin.

Summary of Ground-Based and Aircraft Emissions

To summarize baseline emissions, ground-based emissions from expendables and aircraft emissions from sorties were totaled and compared with Okaloosa County emissions. From Table 4-28 it can be seen that ground-based and aircraft emissions from baseline activities constitute a minor fraction of all Eglin mobile and stationary source emissions.

Table 4-28. Total Baseline Emissions (Tons)

Emissions Source	Tons/Yr				
	NO_x	CO	VOC	PM_{10}	SO_2
Total Ground and Aircraft Emissions	176.97	44.35	4.90	92.68	20.80
Okaloosa County	7,716.55	136,952.46	16,512.59	18,217.72	552.73
Santa Rosa County	11,861.49	86,712.77	6,572.03	7,607.90	4,119.66
Project Percentage of Okaloosa and Santa Rosa Counties	0.90%	0.02%	0.02%	0.07%	2.03%

Source: USEPA, 1999

As can be seen from the information presented in the Table 4-28, increased emissions are minor when compared to the Okaloosa County emissions inventory and are well below the 10 percent criteria. Any effects would be temporary and would fall off rapidly with distance from the test areas.

Due to the short-term effect of air-to-gunnery operations, small arms and detonations, related combustive and fugitive emissions, and the limited area affected, direct exposure of the public to hazardous air pollutants is not expected. The emissions do not contribute to an existing air quality violation, nor exceed 10 percent of the county total emissions; therefore, no air quality impacts are anticipated.

An air quality-related permit would not be required for this activity, nor is any change to Eglin's Title V permit required.

4.8.2 Alternative 2

This alternative represents an authorization of the missions analyzed in Alternative 1. Emissions under this alternative would be the same as those for Alternative 1. There would be no difference in air quality.

4.8.3 Alternative 3

Increases in air and ground-based emissions under this alternative would occur but would still be relatively minor compared to Okaloosa and Santa Rosa Counties' emissions (Table 4-29). An air quality-related permit would not be required for this activity, nor is any change to Eglin's Title V permit required.

Table 4-29. Total Alternative 3 (50 Percent Activity Increase) Emissions (Tons)

Emissions Source	Tons/Yr				
	NO_x	CO	VOC	PM_{10}	SO_2
Total Ground and Aircraft Emissions	258.91	52.03	6.99	28.64	25.88
Okaloosa County	7,716.55	136,952.46	16,512.59	18,217.72	552.73
Santa Rosa County	11,861.49	86,712.77	6,572.03	7.607.90	4,119.66
Project Percentage of Okaloosa and Santa Rosa Counties	1.32%	0.02%	0.03%	0.11%	0.57%

Source: U.S. Environmental Protection Agency Center for Environmental Information and Statistics (CEIS) web site, no date

4.8.4 Alternative 4

Increases in air and ground-based emissions would occur under this alternative but would still be relatively minor compared to Okaloosa County emissions and total annual mobile and stationary source emissions from Eglin AFB (Table 4-30). An air quality-related permit would not be required for this activity, nor is any change to Eglin's Title V permit required.

Table 4-30. Total Alternative 4 (100 Percent Activity Increase) Emissions (tons)

Pollutant Emission Source	Tons/Yr				
	NO_x	CO	VOC	PM_{10}	SO_2
Total Ground and Aircraft Emissions	345.22	69.37	9.32	38.19	34.50
Okaloosa County	7,716.55	136,952.46	16,512.59	18,217.72	552.73
Santa Rosa County	11,861.49	86,712.77	6,572.03	7,607.90	4,119.66
Project Percentage of Okaloosa and Santa Rosa Counties	1.76%	0.03%	0.04%	0.15%	0.75%

Source: U.S. Environmental Protection Agency Center for Environmental Information and Statistics (CEIS) web site, no date

4.9 CUMULATIVE IMPACTS

The Council on Environmental Quality regulations for accomplishing NEPA (42 U.S.C. Sections 4321-4370d) define *cumulative impacts* as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR 1508.7)."

Previous sections of Chapter 4 (Environmental Consequences) considered the cumulative environmental impact of the Proposed Action (and alternatives) when added to the environmental impact of other past and present actions. The cumulative environmental impact of the proposed ATGG training when added to other reasonably foreseeable future actions is considered in this section. NEPA regulations require a discussion of those cumulative impacts that have the potential for significance. Since the Proposed Action occurs primarily on Eglin AFB, other reasonably foreseeable projects and missions on Eglin AFB, particularly those that focus on training at TAs A-77, A-78, A-79, and B-7, are the focus of this analysis.

4.9.1 Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Action

Navy Composite Training Unit Exercise (COMTUEX) and Joint Task Force Exercise (JTFEX). The *Final U.S. Navy COMTUEX and JTFEX Training Environmental Assessment* was prepared in March 2000, and a Finding of No Significant Impact was signed for the expenditure of 250 live Mk-82 bombs during twice annual COMTUEX and JTFEX training at Eglin AFB. Additional environmental documentation will be prepared for future proposed COMTUEX and JTFEX training that would potentially involve actions beyond the scope of the previous COMTUEX/JTFEX analysis. JTFEXs are currently conducted along the eastern seaboard but use Eglin AFB on a limited basis for long-range strikes from the Virginia Capes Operating Area and the Jacksonville Operating Area. Years in which two Gulf of Mexico COMPTUEXs occur would require two nine-day periods of range operations. During these nine days, a Navy carrier would schedule approximately 1,100 fixed wing sorties. Approximately 650 sorties, between 24 and 72 each day, would conduct operations within the Eglin Military Complex performing strike and strike support missions. Test Areas A-77 and A-78 are being considered for the following training missions.

<u>Air-To-Ground Training</u>: There will be up to 12 single ship helicopter air-to-ground training sorties with up to six occurring at night. Flights will conduct 7.62 mm and .50 cal live-fire training on approved targets within the Eglin range.

Amphibious Ready Group/Marine Expeditionary Unit Readiness Training. An environmental assessment entitled *Amphibious Ready Group/Marine Expeditionary Unit Readiness Training Final Environmental Assessment* was prepared April 2003, and a Finding of No Significant Impact was signed for the Proposed Action. Training on Eglin AFB will be performed on water and land test and training ranges. Activities would occur no more than twice yearly and would not exceed a 10-day duration for an ARG/MEU event. The following events for ARG/MEU training would have cumulative impacts at the ATGG ranges.

Live Fire and/or Maneuver: Eight hundred Marines would conduct static live fire and/or live fire with maneuver into established live fire areas. This force would operate on multiple ranges in groups of up to 135 men. This event includes fire and maneuver of the M1A1, Amphibious Assault Vehicle (AAV), Land Assault Vehicle (LAV), High Mobility Multi-Purpose Wheeled Vehicle (HMMWV), mounted Tube Launched, Optically Tracked, Wire Guided (TOW) missiles, heavy machine gun vehicles, small arms, and tracers. Forces would sleep on their packs in the vicinity of firing ranges. Training duration will be for 72 hours, and events will be once during 10-day training period. The types and amounts of munitions involved are given detailed in Appendix H of the ARG/MEU environmental assessment.

Locations: B-75, B-5, B-12, **A-77**, C-72, B-70, B-71, **A-78, A-79, B-7**, B-82, B-76, C-62, C-53, C-5, C-52, B-6 (for wheeled vehicle maneuvering)

Supporting Arms Coordination Exercise (SACEX): For this training event associated with ARG/MEU readiness training, 250 ground-based Marines call in live fire to an established munitions range. Marines travel in wheeled vehicles or by foot. Spotters, forward observers, and forward air controllers would employ laser rangefinders/designators in the impact area. Major weapon systems would include 60- and 81-millimeter mortars, 155-millimeter howitzers, AH-1W and UH-1N gunships, and fixed-wing aircraft (AV-8B and F/A-18). Initial training for ARG/MEU was to be performed on C-52, but may take place at A-77 and A-78 in the future.

Navy Expeditionary Warfare Training (NEWT). NEWT includes activities that are similar to those proposed for ARG/MEU Readiness Training and SACEX live fire and maneuver as described above and may be performed in the near future at TAs A-77, A-78, and A-79.

Introduction of the V-22 Osprey. The Department of the Navy proposes to replace the CH-46 helicopter with a new generation weapons system called the V-22 Osprey. Introduction of the V-22 to the 2nd Marine Aircraft Wing at Marine Corps Air Station, New River, is expected to occur within the next few years.

4.9.2 Potential Cumulative Impacts

Potential cumulative impacts from past, present, and future military actions are described below by resource. Non-military actions that may have a cumulative effect in conjunction with the Proposed Action are considered where applicable. A Potential Cumulative Impacts Summary is presented in Table 4-31.

Table 4-31. Potential Cumulative Impacts Summary

Issue	Alternative			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Noise				
RCW active cavity trees	X	X	X	X
Public exposure	C	C	X	X
Restricted Access	∅	∅	∅	∅
Debris				
Ordnance	X	X	X	X
Habitat Alteration				
Wildfire	X	X	X	X
Sedimentation	∅	∅	∅	∅
Direct Physical Impact				
RCWs	∅	∅	∅	∅
Cultural resources	∅	∅	∅	∅
Chemical Materials				
Soil quality	●	●	●	●
Groundwater quality	●	●	●	●
Surface Water quality	X	X	X	X
Wildlife impacts	X	X	X	X
Air Quality	∅	∅	∅	∅
Floodplains and Coastal Zone	∅	∅	∅	∅

C = Similar to Current Activity on Eglin with No Impact
∅ = No Potential Impact and No Potential Constraints/Permits Required
X = Minimal Potential Impacts, Potential Minor Constraints/Considerations Recommended
● = Potential Impacts, Constraints/Management Requirements Necessary

Noise

Noise impacts may be cumulative in the sense that the average ambient noise of an area could increase from several independent actions, or the increased number of noise events of a particular kind (e.g., an explosion) from unrelated actions may result in an increased sensitivity of human receptors and therefore an increase in the number of complaints. The Preferred Alternative would produce noise that is similar to ongoing activities at Eglin AFB. Presently the noise environment is dominated by aircraft overflights and/or air-to-ground firing of munitions and the dropping of bombs. The impact on the annual average noise of the Proposed Action was considered. The addition of new noise events to an already noisy environment may potentially result in increased or new noise complaints.

Noise from live bombs has the potential to create the greatest response from receptors over air-to-ground gunnery noise due to the decibel (dB) levels associated with it. Noise from bombs may represent a repetitive noise event that may, combined with other bomb noise from other missions, cause an increase in the number of complaints. To analyze this potential, the number of live bombs dropped over the past few years was considered in relation to the number of live bombs proposed for ATGG training. The number of live bombs dropped at Eglin AFB varied from 290 in FY96 to 798 in FY00. During baseline years, four live bombs underwent static ground testing at TA A-79. No live bombs were dropped at A-77, A-78 or B-7. The four live bombs represent a 1.4 percent increase over the FY00 numbers or a 0.5 percent increase over the FY96 amount. The Preferred Alternative (100 percent increase) would be to drop eight live

bombs at A-79 , which results in 2.8 percent increase over the FY00 values or a 1 percent increase over the 1996 amount. The FY00 numbers represent a year in which a COMTUEX/JTFEX training event occurred and a large percentage of the live munitions are attributable to this exercise. Noise modeling and careful attention to weather conditions known to propagate (i.e., spread) noise minimized the effects of bomb noise from the COMTUEX/JTFEX on the community.

Future COMTUEX training would employ dropping one to 15 live bombs at each of the Test Areas A-77 and A-78. As no live bombs were dropped on these test areas during FY98 through FY01, thus an increase in noise at these test areas would ensue. Increases at Eglin AFB of dropping the maximum of 30 live bombs would increase overall noise levels 3.8 percent over FY00 levels and 10.3 percent over FY96 levels.

RCWs

For the Proposed Action at TA A-79, six active RCW trees would be exposed to 140 dBP, while four active RCW trees would be exposed to noise at the 154-dBP level. This testing would result in potential injury to endangered species. Although historically an average of one bomb has been static ground tested from 1998 to 2001, the Navy has ceased using TA A-79; therefore, no impacts from this heavy ordnance are anticipated. If use of the Mk-82 in Johnson's Pond were reinitiated, consultation with USFWS would be needed to abate the potential for injury to red-cockaded woodpeckers on the test range.

Twenty-five-pound rockets have been the largest ordnance used on TAs A-77 and A-78. However, analysis assumed that the target area closest to active RCW trees was used for all 7-lb gunnery activities, but in reality, it may be used a safe distance from the RCW trees. Therefore, noise impacts to RCWs may be less than that modeled.

Across Eglin, no difference in group size or behavior of RCWs has been observed in areas near test areas versus areas without gunnery operations (Hagedorn, 2003). RCWs probably have become habituated to the noise of munitions within the four test sites, and continue to nest successfully in close proximity to the test areas (Hagedorn, 2003). Suitable habitat appears to outweigh any negative influences associated with noise. Studies at a Navy bombing range in Mississippi have indicated that RCWs can acclimate to excessive noise levels (Jackson, 1980). Observations have indicated that many animals become adapted to human activities and noises (Busnel, 1978). Scientists who have researched the effects of noise on wildlife report that animals will react with a startle effect from noises, but adapt over time, so that even this behavior is eradicated (Busnel, 1978). Based on the fact that the RCW population continues to grow at Eglin, it appears that they have adapted to much of the noise associated with military missions. However, it may be necessary to consult with the USFWS for noise impacts to RCWs dependent on the actual locations where munitions are being used on the test areas in the future.

Restricted Access

The Preferred Alternative would not have combined restated access impacts. The roads into test areas A-77, A-78, A-79, and B-7 are normally kept closed at all times. Access through the range gates is controlled through the Range Operations Control Center (ROCC) and a Z-clearance

authorization number or mission number is required. Similar upcoming training activities such as the ARG/MEU Readiness Training and COMTUEX that may encompass air-dropped ordnance may expand or activate safety footprints not regularly used.

Safety

There would be no cumulative safety impacts from the Preferred Alternative. Activities would be coordinated and conducted concurrently and in the same vicinity with other test or training missions and following standard operating procedures. Future missions would have no bearing on the safety of the Preferred Alternative. Thus, there would be no combined safety concerns.

Debris

The *Interstitial Area Final Programmatic Environmental Assessment* (U.S. Air Force, 1998a) analyzed the environmental impact of increasing yearly ground troop movement in interstitial spaces from 55,800 troops per year (1997) to 167,500, equal to 200 percent. No environmental impacts were determined from the 200 percent increase in ground troops regarding debris and the use of blanks, smokes, and flares during ground troop training activities in interstitial spaces.

The Amphibious Ready Group/Marine Expeditionary Unit Final Environmental Assessment (U.S. Air Force, 2003d) and subsequent Finding of No Significant Impact (FONSI) analyzed potential debris, such as shell casings, canisters from signal smokes, flares, as well as litter and refuse from ground troop movement, that may be deposited from ARG/MEU activities. No environmental impacts were determined if management requirements were followed, which included properly disposing of, or packing out debris and refuse. In addition, AAC Plan 32-5 and AAC Plan 32-9 is to be complied with for the ARG/MEU exercises for recycling, hazardous materials management, and proper disposal of wastes.

Debris will accumulate at increasing rates on the ATGG ranges with the addition of future ARG/MEU and COMTUEX training missions. Range sustainability best management practices, which include the activities outlined in the *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) and Appendix B and Appendix E, are recommended to reduce the potential for cumulative impacts from debris.

Habitat Alteration

Catastrophic Wildfire

*Sensitive Habitat*s: Under adverse conditions, wildfires escaping from test ranges that do not undergo wildfire suppression activities will grow large in size and may impact numerous active RCW cavity trees. Ten such large fires (>900 acres) have occurred over the past five years (U.S. Air Force, 2003b). In the five-year period from 1998 to 2002, a total of 189 active RCW cavity trees and 681 inactive cavity trees were burned by wildfires started by the Air Force missions on these test areas (U.S. Air Force, 2003c). A total of 119 of these cavity trees died over that period of time from various causes, including fire. Given that mortality rates for unprepared cavity trees under normal burning conditions may exceed six percent (U.S. Air Force, 2003a), the Proposed Action has the potential to increase catastrophic wildfire RCW mortality up to

12 percent but implementation of fire management practices would reduce the incidence of wildfire.

Cumulative impacts from wildfires could positively affect flatwoods salamander habitat, as they could benefit the area by eliminating the St. John's wort that can take over flatwoods salamander ponds in the absence of fire.

Wildfire is likely beneficial to the bog frog because it helps to control hardwood encroachment; however, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. Adverse cumulative wildfire impacts to bog frog habitat are not anticipated.

Tier I communities, significant botanical sites, and special natural areas have been identified within 1 km of TAs A-77, A-78, A-79, and B-7, but none of these habitats are located within the boundaries of the test areas. Eglin's two largest tracts of old growth are found just east of A-78 and north of A-77, and the area known as the Patterson Special Natural Area encompasses several tracts of old-growth immediately adjacent to the north and east of TA A-78. Catastrophic wildfire remains the largest single source of old-growth mortality. If catastrophic wildfires continue to occur in these areas, old-growth resources could be negatively impacted. Wildfire suppression activities are recommended in these areas to negate potential cumulative impacts from past, present, and future ATGG training missions.

Direct Physical Impact

RCWs

Cumulative impacts to RCWs from direct physical impact is unlikely and therefore not significant.

Cultural Resources

All projects that would pose impact threats to cultural resources will be subject to Section 106 review on an action per action basis. If protection or avoidance is not possible, eligible resources would undergo mitigative efforts.

Chemical Materials

Water Resources and Water Quality

Based on current chemical fate and transport literature and studies of ordnance from other gunnery ranges (Appendix F), constituents from ordnance may migrate to surface water and groundwater. Routine monitoring for contaminants in soil and groundwater is recommended along with range sustainability BMPs to assure that no adverse cumulative impacts to water resources are occurring at ATGG ranges from past, present, or future activities.

Soil Quality

Potential cumulative soil quality impacts involve multiple or combined occurrences of spills, emissions, and by-products from past, present, and future actions, and the continuous deposition of solid debris, waste, or unexploded ordnance in test and training areas. Cumulative impacts from spills would not be significant as fueling operations do not occur on the ATGG ranges. The potential cumulative impacts of all past, present, and future ordnance emissions and by-products, in combination with ATGG training activities is difficult to assess. Clean-up of ordnance from ATGG ranges was shown to be less than 1 percent of the total expended items. SESOIL modeling of chemical constituents in current ATGG ordnance showed exceedances to soil screening levels. Additional input of debris and UXO material may increase the amount of chemicals entering the soil. To prevent adverse cumulative impacts from hazardous materials on test areas sampling of soil for contamination from ordnance and implementation range sustainability BMPs which include the activities outlined in the *Eglin Range UXO and Residue Strategic Plan* (U.S. Air Force, 2001) and procedures in Appendix B and Appendix E, are recommended.

Wildlife

Observance of management requirements will minimize the extent of adverse impacts. Close monitoring of species numbers on Eglin AFB and continued coordination of the Air Force with federal agencies regarding sensitive species will ensure that no significant cumulative impacts occur.

Air Quality

Cumulative air quality analysis considered all Eglin reportable emissions, which includes nonmission activities as well as mission actions, and county totals. The potential contribution of air emissions from the Proposed Action was evaluated in Chapter 4 with respect to overall Eglin air emissions and county emissions and found not to be significant. Thus, there are no significant cumulative impacts with respect to air quality.

Floodplains and Coastal Zone

There would be no cumulative impacts to floodplains or the coastal zone. Historically, there has never been an issue with floodplains due to the conduct of missions on Eglin property. No inconsistencies with the state's Coastal Zone Management Plan have been identified for past missions.

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APPENDIX A

RELEVANT AND PERTINENT LAWS, REGULATIONS, AND POLICIES

RELEVANT AND PERTINENT LAWS, REGULATIONS, AND POLICIES

The Air-to-Ground Gunnery Programmatic Environmental Assessment was prepared with consideration and compliance with relevant and pertinent environmental laws, regulations, and policies. This section includes federal executive orders and laws; Department of Defense (DoD) directives and instructions; Air Force Instructions (AFIs) and policy directives; and Florida state statutes and administrative codes. This list has been compiled and limited to include the most relevant laws, regulations, and policies that are pertinent to the specific mission activities defined in this document. It is further recognized that additional laws and regulations may exist and will be included with subsequent updates.

General

42 USC 4321 et seq.; 1969; National Environmental Policy Act of 1969 (NEPA); requires that federal agencies (1) consider the consequences of an action on the environment before taking the action and (2) involve the public in the decision making process for major federal actions that significantly affect the quality of the human environment.

Executive Order 12372; 14-Jul-82; Intergovernmental Review of Federal Programs; directs federal agencies to inform states of plans and actions, use state processes to obtain state views, accommodate state and local concerns, encourage state plans, and coordinate states' views.

Executive Order 12856; 3-Aug-93; Right to Know Laws and Pollution Prevention Requirements; directs all federal agencies to incorporate pollution planning into their operations and to comply with toxic release inventory requirements, emergency planning requirements, and release notifications requirements of Emergency Planning and Community Right-to-Know Act (EPCRA).

Executive Order 12898; 11-Feb-94; Environmental Justice; directs federal agencies to identify disproportionately high and adverse human health or environmental impacts resulting from programs, activities, or policies on minority populations.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention.

Air Force Instruction 32-7045; 1-Apr-94; Environmental Compliance and Assessment; implements AFPD 32-70 by providing for an annual internal self-evaluation and program management system to ensure compliance with federal, state, local, DoD, and Air Force environmental laws and regulations.

Air Force Instruction 32-7061; 24-Jan-95; Environmental Impact Analysis Process; provides a framework for how the Air Force is to comply with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations.

Air Force Instruction 32-7062; 1-Apr-94; Air Force Comprehensive Planning; implements AFPD 32-70 by establishing Air Force Comprehensive Planning Program for development of Air Force installations, ensuring that natural, cultural, environmental, and social science factors are considered in planning and decision making.

Physical Resources

Air Quality

42 USC 7401 et seq.; 40 CFR Parts 50 & 51; 1996; Clean Air Act, National Ambient Air Quality Standards (CAA, NAAQS); requires emission sources to comply with air quality standards and regulations established by federal, state, and local regulatory agencies.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention. Implements CAA.

Air Force Instruction 32-7040; 9-May-94; Air Quality Compliance; sets forth actions for bases to implement to achieve and maintain compliance with applicable standards for air quality compliance and responsibilities of those implementing them. Includes requirements for NEPA and RCRA as well as CAA.

F.S. Ch. 403, Part I; 1996; Florida Air and Water Pollution Control Act; regulates air pollution within the state.

FAC Chap. 62-204; 1996; Florida State Implementation Plan, with Ambient Air Quality Standards and PSD Program; establishes state air quality standards and requirements for maintaining compliance with NAAQS.

FAC Chap. 62-213; 1996; Operation Permits for Major Sources of Air Pollution; adopted Prevention of Significant Deterioration (PSD) permit program, designed to control the impact of economic growth on areas that are already in attainment.

Air Space Use

49 USC 106 & Subtitle VII; 1997-Supp; Federal Aviation Act of 1958; created the Federal Aviation Administration (FAA) and establishes administrator with responsibility of ensuring aircraft safety and efficient utilization of the National Airspace System.

14 CFR Part 71; 1997; Federal Aviation Regulation (FAR); defines federal air routes, controlled airspace, and flight locations for reporting position.

14 CFR Part 73; 1997; Federal Aviation Regulation (SFAR No. 53); defines and prescribes requirements for special use airspace.

14 CFR Part 91; 1997; Federal Aviation Regulation (FAR); governs the operation of aircraft within the United States, including the waters within 3 nautical miles of the U.S. coast. In addition, certain rules apply to persons operating in airspace between 3 and 12 nautical miles from the U.S. coast.

Land Resources

16 USC 670a to 670o; 1997-Supp; Sikes Act, Conservation Programs on Military Reservations; DoD, in a cooperative plan with DOI and state, opens Air Force bases to outdoor recreation, provides the state with a share of profits from sale of resources (timber), and conserves and rehabilitates wildlife, fish, and game on each reservation. The Air Force is to manage the natural resources of its reservations to provide for sustained multipurpose use and public use.

USC 1701 et seq., (Public Law 94-579; 1997-Supp; Federal Land Policy and Management Act of 1976 (FLPMA); provides that the Secretary of Interior shall develop land use plans for public lands within BLM jurisdiction to protect scientific, scenic, historical, ecological, environmental, and archeological values and to accommodate needs for minerals, food, and timber.

Air Force Instruction 32-7062; 1-Apr-94; Air Force Comprehensive Planning; implements AFPD 32-70 by establishing Air Force Comprehensive Planning Program for development of Air Force installations, ensuring that natural, cultural, environmental, and social science factors are considered in planning and decision making.

Air Force Instruction 32-7063; 31-Mar-94; Air Installation Compatible Use Zone Program (AICUZ); provides a framework to promote compatible development within AICUZ area of influence and protects Air Force operational capability from the effects of land use that is incompatible with aircraft operations.

Air Force Instruction 32-7064; 22-Jul-94; Integrated Natural Resources Management; provides for development of an integrated natural resources management plan to manage the installation ecosystem and integrate natural resources management with the rest of the installation's mission. Includes physical and biological resources and uses.

Noise

42 USC 4901 to 4918, Public Law 92-574; 1997-Supp; Noise Control Act of 1972 (NCA); provides that each federal agency must comply with federal, state, interstate, and local requirements for control and abatement of environmental noise.

49 USC 44715; 1997-Supp; Controlling Aircraft Noise and Sonic Boom; provides that the FAA will issue regulations in consultation with the U.S. Environmental Protection Agency (USEPA) to control and abate aircraft noise and sonic boom.

Executive Order 12088; 1978; Federal Compliance with Pollution Control Standards; requires the head of each executive agency to take responsibility for ensuring all actions have been taken to prevent, control, and abate environmental (noise) pollution with respect to federal activities.

Air Force Instruction 32-7063; 1-Mar-94; Air Installation Compatible Use Zone Program (AICUZ); delineates study to define and map noise contours. To be updated when noise exposure in Air Force operations results in a change of day-night average sound level of 2 decibels (dBs) or more as compared to the noise contour map in the most recent AICUZ study.

Water Resources

33 USC 1251 et seq.; 1997-Supp; Clean Water Act (CWA) (Federal Water Pollution Prevention and Control Act, FWPCA); in addition to regulating navigable water quality, establishes National Pollutant Discharge Elimination System (NPDES) permit program for discharge into surface waters and storm water control; Army Corps of Engineers permit and state certification for wetlands disturbance; regulation of ocean discharge; sewage wastes control; and oil pollution prevention.

42 USC 300f et seq.; 1997-Supp; Safe Drinking Water Act (SDWA); requires the promulgation of drinking water standards, or maximum contaminant levels (MCLs), which are often used as cleanup values in remediation; establishes the underground injection well program; and establishes a wellhead protection program.

42 USC 6901 et seq.; 29-May-05; Resource Conservation and Recovery Act of 1976 (RCRA); establishes standards for management of hazardous waste so that water resources are not contaminated. RCRA Corrective Action Program requires cleanup of groundwater that has been contaminated with hazardous constituents.

42 USC 9601 et seq., Public Law 96-510; 11-Dec-80; Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); establishes the emergency response and remediation program for water and groundwater resources contaminated with hazardous substances.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention. Implements Clean Water Act, Safe Drinking Water Act, and Water Quality Act of 1987.

Air Force Instruction 32-7041; 13-May-94; Water Quality Compliance; instructs the Air Force on maintaining compliance with the Clean Water Act; other federal, state, and local environmental regulations; and related DoD and Air Force water quality directives.

Air Force Instruction 32-7064; 22-Jul-94; Integrated Natural Resources Management; sets forth requirements for addressing wetlands, floodplains, and coastal and marine resources in an integrated natural resources management plan (INRMP) for each installation.

Florida Statutes Chap. 403, Part I; Florida Air and Water Pollution Control Act; establishes the regulatory system for water resources in Florida.

Biological Resources

Animal Resources

16 USC 703 - 712; 1997-Supp; Migratory Bird Treaty Act (MBTA); makes it illegal to take, kill, or possess migratory birds unless done so in accordance with regulations. An exemption may be obtained from the Department of the Interior for taking a listed migratory bird.

Air Force Instruction 32-7064; 22-Jul-94; Integrated Natural Resources Management; explains how to manage natural resources on Air Force property and comply with federal, state, and local standards for resource management.

Threatened and Endangered Species

16 USC 1531 to 1544-16 USC 1536(a); 1997-Supp; Endangered Species Act 1973 (ESA); federal agencies must ensure their actions do not jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify the habitat of such species and must set up a conservation program.

50 CFR Part 450; 1996; Endangered Species Exemption Process; these rules set forth the application procedure for an exemption from complying with Section 7(a)(2) of the ESA, 16 USC 1536(a)(2), which requires that federal agencies ensure their actions do not affect endangered or threatened species or habitats.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention. Implements ESA.

Air Force Instruction 32-7064; 22-Jul-94; Integrated Natural Resources Management; directs an installation to include in its INRMP procedures for managing and protecting endangered species or critical habitat, including state-listed endangered, threatened, or rare species, and discusses agency coordination.

Human Safety

29 CFR 1910.120; 1996; Occupational Safety and Health Act, Chemical Hazard Communication Program (OSHA); requires that chemical hazard identification, information, and training be available to employees using hazardous materials and institutes material safety data sheets (MSDSs) to provide this information.

Department of Defense Instruction 6055.1; establishes occupational safety and health guidance for managing and controlling the reduction of radio frequency exposure.

Department of Defense Flight Information Publication; identifies regions of potential hazard resulting from bird aggregations or obstructions and military airspace noise-sensitive locations, and defines airspace avoidance measures.

Air Force Instructions 13-212v1 and v2; 1994; Weapons Ranges and Weapons Range Management; establishes procedures for planning, construction, design, operation, and maintenance of weapons ranges as well as defines weapons safety footprints, buffer zones, and safest procedures for ordnance and aircraft malfunction.

Air Force Instruction 32-2001; 16-May-94; Fire Protection Operations and Fire Prevention Program; identifies requirements for Air Force fire protection programs (equipment, response time, and training).

Air Force Instruction 32-7063; 1-Mar-94; Air Installation Compatible Use Zone Program (AICUZ); delineates study to define and map accident potential zones and runway clear zones around the installation and contains specific land use compatibility recommendations based on aircraft operational effects and existing land use, zoning, and planned land use.

Air Force Manual 91-201; 12-Jan-96; Explosives Safety Standards; regulates and identifies procedures for explosives safety and handling as well as defining requirements for ordnance quantity distances, safety buffer zones, and storage facilities.

Air Force Instruction 91-301; 1-Jun-96; Air Force Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program; identifies occupational safety, fire prevention, and health regulations governing Air Force activities and procedures associated with safety in the workplace.

Habitat Resources

Executive Order 11990; 24-May-77; Protection of Wetlands; requires federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in their activities. Construction is limited in wetlands and requires public participation.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention. Implements Executive Order 11988 and 11990.

Anthropogenic Resources

Hazardous Materials

7 USC 136 et seq., Public Law 92-516; 1997-Supp; Federal Insecticide, Fungicide, and Rodenticide Act Insecticide and Environmental Pesticide Control (FIFRA); establishes requirements for use of pesticides that may be relevant to activities at Eglin Air Force Base.

42 USC 6901 et seq.; 1980; Resource Conservation and Recovery Act of 1976 and Solid Waste Disposal Act of 1980 (RCRA); Subchapter III sets forth hazardous waste management provisions; Subchapter IV sets forth solid waste management provisions; and Subchapter IX sets forth underground storage tank provisions with which federal agencies must comply.

42 USC 9601 et seq., Public Law 96-510; 1997-Supp; Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA); establishes the liability and responsibilities of federal agencies for emergency response measures and remediation when hazardous substances are or have been released into the environment.

42 USC 11001 to 11050; 1995; Emergency Planning and Community Right-to-Know Act (EPCRA); provides for notification procedures when a release of a hazardous substance occurs; sets up community response measures to a hazardous substance release; and establishes inventory and reporting requirements for toxic substances at all facilities.

42 USC 13101 to 13109; 1990; Pollution Prevention Act of 1990 (PPA); establishes source reduction as the preferred method of pollution prevention, followed by recycling, treatment, then disposal into the environment. Establishes reporting requirements to submit with EPCRA reports. Federal agencies must comply.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; provides for developing and implementing an Air Force Environmental Quality Program composed of four pillars: cleanup, compliance, conservation, and pollution prevention. Implements RCRA, CERCLA, EPCRA, Pollution Prevention Act, Executive Order 12088, Executive Order 12777, and Executive Order 12586. Implements DoD Instruction 4120.14, DoD Directive 4210.15, and DoD Directive 5030.41.

Air Force Instruction 32-7020; 19-May-94; Environmental Restoration Program; introduces the basic structure and components of a cleanup program under the Defense Environmental Restoration Program. Sets forth cleanup program elements, key issues, key management topics, objectives, goals, and scope of the cleanup program.

Air Force Instruction 32-7042; 12-May-94; Solid and Hazardous Waste Compliance; provides that each installation must develop a hazardous waste (HW) and a solid waste (SW) management plan; characterize all HW streams; and dispose of them in accordance with the AFI. Plans must address pollution prevention as well.

Air Force Instruction 32-7080; 12-May-94; Pollution Prevention Program; requires each installation to develop a pollution prevention management plan that addresses ozone-depleting chemicals; USEPA 17 industrial toxics; hazardous and solid wastes; obtaining environmentally friendly products; energy conservation, and air and water.

Air Force Policy Directive 40-2; 8-Apr-93; Radioactive Materials; establishes policy for control of radioactive materials, including those regulated by the U.S. Nuclear Regulatory Commission (NRC) but excluding those used in nuclear weapons.

10 CFR Part 20; 1997; Nuclear Regulatory Commission; Standards for Protection Against Radiation; establishes survey and monitoring protocols, as well as occupational dose limits, for radioactive materials.

Air Force Instruction 13-212 Vol. I; 1-Sept-00; Test and Training Ranges; establishes policy and procedures for the use of depleted uranium (DU) by Air Force units.

Air Force Instruction 40-201; 1-Sept-00; Managing Radioactive Materials in the U.S. Air Force; establishes how Air Force employees and activities acquire, receive, store, distribute, use, transfer, or dispose of any item or part that contains radioactive material.

Cultural Resources

10 USC 2701 note, Public Law 103-139; 1997-Supp; Legacy Resource Management Program (LRMP); provides funding to conduct inventories of all scientifically significant biological assets of Eglin AFB.

16 USC 431 et seq.; PL 59-209; 34 Stat. 225; 43 CFR 3; 1906; Antiquities Act of 1906; provides protection for archeological resources by protecting all historic and prehistoric sites on federal lands. Prohibits excavation or destruction of such antiquities without the permission (Antiquities Permit) of the secretary of the department that has the jurisdiction over those lands.

16 USC 461 to 467; 1997-Supplemental; Historic Sites, Buildings and Antiquities Act; establishes national policy to preserve for public use historic sites, buildings, and objects of national significance: the Secretary of the Interior operates through the National Park Service to implement this national policy.

16 USC 469 to 469c-1; 1997-Supp; Archaeological and Historic Preservation Act of 1974 (AHPA); directs federal agencies to give notice to the Secretary of the Interior before starting construction of a dam or other project that will alter the terrain and destroy scientific, historical, or archeological data, so that the Secretary may undertake preservation.

16 USC 470aa-470mm, Public Law 96-95; 1997-Supp; Archaeological Resources Protection Act of 1979 (ARPA); establishes permit requirements for archaeological investigations and ensures protection and preservation of archaeological sites on federal property.

16 USC 470 to 470w-6-16 USC 470f, 470h-2; 1997-Supp; National Historic Preservation Act (NHPA); requires federal agencies to (1) allow the Advisory Council on Historic Preservation to comment before taking action on properties eligible for the National Register and (2) preserve such properties in accordance with statutory and regulatory provisions.

25 USC 3001 - 3013), (Public Law 101-601; 1997-Supp; Native American Graves Protection and Repatriation Act of 1991 (NAGPRA); requires federal agencies to obtain a permit under the Archeological Resources Protection Act before excavating Native American artifacts. Federal agencies must inventory and preserve such artifacts found on land within their stewardship.

42 USC 1996; 1994; American Indian Religious Freedom Act (AIRFA); requires federal agencies to do what they can to ensure that American Indians have access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites in the practice of their traditional religions.

32 CFR Part 200; 1996; Protection of Archaeological Resources: Uniform Regulations; provides that no person may excavate or remove any archaeological resource located on public lands or Native American lands unless such activity is conducted pursuant to a permit issued under this Part or is exempted under this Part.

36 CFR Part 60; 1996; Nominations to National Register of Historic Places; details how the federal agency Preservation Officer is to nominate properties to the Advisory Council for consideration to be included on the National Register.

36 CFR Part 800; 1995; Protection of Historic and Cultural Properties; sets out the Section 106 process for complying with Sections 106 and 110 of the NHPA: the agency official, in consultation with the State Historic Preservation Officer (SHPO), identifies and evaluates affected historic properties for the Advisory Council.

Executive Order 11593, 16 USC 470; 13-May-71; Protection and Enhancement of the Cultural Environment; instructs federal agencies to identify and nominate historic properties to the National Register, as well as avoid damage to historic properties eligible for National Register.

Executive Order 13007; 24-May-96; directs federal agencies to provide access to and ceremonial use of sacred Native American sites by Native American religious practitioners as well as promote the physical integrity of sacred sites.

DoD Directive 4710.1; Archaeological and Historic Resources Management (AHRM); establishes policy requirements for archaeological and cultural resource protection and management for all military lands and reservations.

Air Force Policy Directive 32-70; 20-Jul-94; Environmental Quality; develops and implements the Air Force Environmental Quality Program composed of cleanup, compliance, conservation, and pollution prevention. Implements NHPA, Executive Order 11593, and DoD Directive 470.1.

Air Force Instruction 32-7065; 13-Jun-94; Cultural Resource Management; directs Air Force bases to prepare cultural resources management plans (CRMPs) to comply with historic preservation requirements, Native American considerations, and archeological resource protection requirements, as part of the Base Comprehensive Plan.

Air Force Policy Letter; 4-Jan-82; establishes Air Force policy to comply with historic preservation and other federal environmental laws and directives.

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APPENDIX B

PROPOSED BEST MANAGEMENT PRACTICES FOR RANGE SUSTAINMENT

PROPOSED BEST MANAGEMENT PRACTICES FOR RANGE SUSTAINMENT TEST AREAS A-77, A-78, A-79, AND B-7

NOISE

- Notify the public of mission schedules when munition activity is expected to increase.
- Use of targets should be shifted to internally established targets that are away from active red-cockaded woodpecker (RCW) cavity trees.
- Firing and overflight activities should occur at regular intervals, when possible.
- Follow guidelines presented in the U.S. Army Management Plan for RCWs and corresponding U.S. Fish and Wildlife Service (USFWS) Biological Opinion to minimize potential noise and disturbance from ground movement activities.
    - Allow only transient foot and vehicle traffic within 200 feet of RCW cavity trees for no more than 2 hours.
    - Do not allow bivouacking, excavating/digging, or command post establishment within the 200-foot buffer zone.
- The proponent may be required to mark 200-foot buffer zones around active RCW cavity trees potentially impacted by ground movements.
- Military activities that are within or near stands of mature longleaf pine and scheduled during RCW nesting season (late April – July) should be coordinated with the Natural Resources Branch.
- Monitoring of RCWs should also continue.

HABITAT ALTERATION

- Follow Eglin Wildfire Specific Action Guide Restrictions for pyrotechnics use by the specified class for the day; specifically, do not conduct hot missions under class D or E levels as determined by the Wildland Fire Management Program at Jackson Guard.
- Have sufficient resources (i.e., fire management personnel and equipment) available to respond to fire emergencies under marginal conditions.
- Maintain graded road grid around gunship ranges to facilitate suppression in the event of a wildfire ignition.
- Maintain 2-year prescribed burn interval within a 2-mile buffer area around all of these ranges to reduce hazardous fuel accumulations.
- Establish postmission monitoring for 1 hour to search for smoke and hotspots on the range.
- Prep RCW cavity trees before prescribed burns.

- When monitoring RCW cavity trees adjacent to these ranges, record cause of mortality.
- Replace any cavity tree damaged by fire to the point that it is unsuitable for nesting or roosting with an artificial cavity within 72 hours of the damage, according to the *Eglin Air Force Base Integrated Natural Resources Management Plan Biological Opinion* from USFWS (U.S. Air Force, 2002).

DIRECT PHYSICAL IMPACT

- Use frangible munitions.

CHEMICAL MATERIALS

Potential Soil, Surface Water, and Groundwater Quality Impacts

- Use of bullet containment methods and lead-based projectiles management.
- Proactive monitoring for potential migration of metals.
- Runoff control through the use of vegetative ground cover, mulches and compost, surface covers, and engineered runoff controls.
- Use of munitions composed of non-lead alloys, when possible.
- Recovery of munition casings from streams, wetland areas, and interior objectives, when possible.
- Recovery of approximately 60 percent of the brass casings expended during ATGG training.

Potential Impacts to Wildlife

- Employment of frangible munitions, when possible.
- Employment of non-lead munitions, when possible.
- Recovery of munition casings from streams, wetland areas, and interior objectives, when possible.
- Recovery of approximately 60 percent of the brass casings expended during ATGG training.
- Avoidance of deposition of casings and other materials into sensitive species' habitats.

REFERENCES

U.S. Air Force, 2002. *Eglin Air Force Base Integrated Natural Resources Management Plan Biological Opinion from USFWS.*

APPENDIX C

COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

Introduction

This document provides the State of Florida with the U.S. Air Force's Consistency Determination under CZMA Section 307 and 15 C.F.R. Part 930 sub-part C. The information in this Consistency Determination is provided pursuant to 15 C.F.R. Section 930.39.

Pursuant to Section 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, its implementing regulations at 15 C.F.R. Part 930, this is a Federal Consistency Determination for activities described within the Air-to-Ground Gunnery: A-77, A-78, A-79, and B-7, Eglin AFB, Florida, Programmatic Environmental Assessment (Chapter 2 of the Programmatic Environmental Assessment (PEA]).

Proposed Federal Agency Action

The Proposed Action and the Preferred Alternative of the PEA is Alternative 4, which entails increasing mission activity by 100 percent. More detail of air-to-ground gunnery missions is provided in Chapter 2 of the PEA.

The Air-to-Ground Gunnery Programmatic Environmental Assessment has analyzed the potential effects to the land or water uses or natural resources of the state of Florida's coastal zone within the context of the statutes listed in the Florida Coastal Management Program (below).

Federal Consistency Review

Statutes addressed as part of the Florida Coastal Zone Management Program consistency review and considered in the analysis of the Proposed Action are discussed in the following table.

Pursuant to 15 C.F.R. § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 C.F.R. § 930.41(b). Florida's concurrence will be presumed if Eglin AFB does not receive its response on the 60th day from receipt of this determination.

Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161 *Beach and Shore Preservation*	The proposed project would not adversely affect beach and shore management, specifically as it pertains to: -The Coastal Construction Permit Program. –The Coastal Construction Control Line (CCCL) Permit Program. -The Coastal Zone Protection Program. All land activities would occur on federal property.	Authorizes the Bureau of Beaches and Coastal Systems within Florida Department of Environmental Protection (FDEP) to regulate construction on or seaward of the states' beaches.
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	All activities would occur on federal property.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186 *State and Regional Planning*	All activities would occur on federal property. State and regional agencies will be provided the opportunity to review the Programmatic Environmental Assessment (PEA). The Proposed Action would not have an affect on state and regional planning requirements.	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252 *Emergency Management*	The Proposed Action would not increase the state's vulnerability to natural disasters. Emergency response and evacuation procedures would not be impacted by the Proposed Action.	Provides for planning and implementation of the state's response to, efforts to recover from, and the control of natural and manmade disasters.
Chapter 253 *State Lands*	All activities would occur on federal property.	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.
Chapter 258 *State Parks and Preserves* Chapter 259 *Land Acquisition for Conservation or Recreation* Chapter 260 *Recreational Trails System* Chapter 375 *Multipurpose Outdoor Recreation; Land Acquisition, Management, and Conservation*	State parks, recreational areas, and aquatic preserves would not be affected by the Proposed Action. Tourism and outdoor recreation would not be affected. Opportunities for recreation on state lands would not be affected. All activities would occur on federal property. Receptors potentially impacted would include the military and the public desiring to use Eglin's roads, test areas, recreational areas, or airspace. Restricted access impacts would be associated with mission activities at Test Areas A-77, A-78, A-79, and B-7 involving the detonation of live munitions and other testing/ training missions. Increased frequency of missions may cause extended time in range closure; thus impacts to restricted access and safety may ensue.	Addresses administration and management of state parks and preserves (Chapter 258). Authorizes acquisition of environmentally endangered lands and outdoor recreation lands (Chapter 259). Authorizes acquisition of land to create a recreational trails system and to facilitate management of the system (Chapter 260). Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs (Chapter 375).

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
Chapter 267 *Historical Resources*	Portions of some test areas in this document are considered high probability zones for the presence of archaeological resources (Table 3-10 in the PEA). Such regions exist on Test Areas A-78 and B-7, as well as immediately adjacent to the east and west boundaries of Test Area A-77. If activities will take place only within A-77 boundaries, then no cultural concerns exist for that area. At the two other sites, Eglin's Cultural Resources Division (AAC/EMH) would like to survey before exercises begin. However, AAC/EMH does not intend to impede missions on these test areas; they will survey as soon as possible as mission schedules allow. Potential National Register-eligible sites exist on Test Area A-79. These sites must be protected until further testing can provide enough information to render a determination of eligibility. Protection will include avoidance by fencing, marking, or some other means. These measures will also be negotiated with the SHPO. AAC/EMH will provide maps indicating the locations that need to be avoided and protected. Potential impacts to cultural resources are further discussed in Chapter 4, Section 4.6 of the PEA.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288 *Commercial Development and Capital Improvements*	The Proposed Action occurs on federal property. The Proposed Action is not anticipated to have any effect on future business opportunities on state lands.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334 *Transportation Administration* Chapter 339 *Transportation Finance and Planning*	The proposed project would not have an impact on transportation administration of the state. The proposed project would have no effect on the finance and planning needs of the state's transportation system.	Addresses the state's policy concerning transportation administration (Chapter 334). Addresses the finance and planning needs of the state's transportation system (Chapter 339).
Chapter 370 *Saltwater Fisheries*	The Proposed Action would not have an effect on saltwater fisheries.	Addresses management and protection of the state's saltwater fisheries.

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
Chapter 372 *Wildlife*	Potential impacts to wildlife, including threatened and endangered species are evaluated in Chapter 4, Sections 4.5 through 4.8. The Proposed Action may affect threatened and/or endangered species. Formal consultation with the U.S. Fish and Wildlife Service (USFWS) has been initiated. Impacts to threatened and endangered species would be minimized or prevented through the implementation of management practices and coordination with Eglin's Natural Resources Branch (AAC/EMSN) and state and federal protected resource management agencies.	Addresses the management of the wildlife resources of the state.
Chapter 373 *Water Resources*	The potential for impacts to surface water quality from munitions, chaff, and flares would increase under Alternative 4, the Preferred Alternative; however, it is still unlikely given the distance between target areas and water bodies. Effects to water quality are further discussed in Chapter 4, Section 4.7 of the PEA.	Addresses the state's policy concerning water resources.
Chapter 376 *Pollutant Discharge Prevention and Removal*	The discharge of solid materials, including casings, bullets, and debris may occur during training exercises. Chapter 4, Section 4.4.4 further addresses impacts from the expenditures of ordnance items and UXO removal. Chapter 4, Section 4.7 discusses effects from chemical materials associated with the Proposed Action. Additionally, Appendices E and F analyze pollution discharges in conjunction with the mission.	Regulates transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.
Chapter 377 *Energy Resources*	Energy resource production, including oil and gas, and the transportation of oil and gas, would not be affected by the Proposed Action.	Addresses regulation, planning, and development of energy resources of the state.
Chapter 380 *Land and Water Management*	The Proposed Action would primarily occur on federally owned lands. Under the Proposed Action, development of state lands with regional (i.e., more than one county) impacts would not occur. Areas of Critical State Concern or areas with approved state resource management plans such as the Northwest Florida Coast and the Escambia and Santa Rosa counties coastal area would not be affected. Changes to coastal infrastructure such as bridge construction, capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing or construction would not occur.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381 *Public Health, General Provisions*	The Proposed Action does not involve the construction of an on-site sewage treatment and disposal system.	Establishes public policy concerning the state's public health system.

Florida Coastal Management Program Consistency Review Cont'd

Statute	Consistency	Scope
Chapter 388 *Mosquito Control*	The Proposed Action would not affect mosquito control efforts.	Addresses mosquito control effort in the state.
Chapter 403 *Environmental Control*	Combustion products and fugitive dust from munitions detonation activities would be generated from missions on Test Areas A-77, A-78, A-79, and B-7 and within the overlying airspace. Analysis considers the amount of combustive emissions and uncontrolled fugitive dust associated with ground-based emissions (e.g., from munitions detonations), and exhaust emissions from aircraft. Impacts to air quality would not be significant. Chapter 4, Section 4.8 further discusses impacts to air quality as a result of the Proposed Action. Appendix J provides the methods and details for the air quality analysis. An air quality-related permit would not be required for this activity, nor is any change to Eglin's Title V permit required.	Establishes public policy concerning environmental control in the state.
Chapter 582 *Soil and Water Conservation*	Impacts from soil quality are addressed in Chapter 4, Section 4.7.4 of the PEA. The Proposed Action is not anticipated to have a significant effect on soils. The Proposed Action would result in soil erosion and increases in turbidity from soil erosion. Best management practices for preventing and controlling erosion would be necessary and are described in Appendix B.	Provides for the control and prevention of soil erosion.

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APPENDIX D

TARGET SITE PHOTOS

Range A-77, GPS N30.49670° & W086.84692°, Miscellaneous Vehicles

Range A-77, GPS N30.49692° & W086.84727°, M-47 Tank

Range A-78, GPS N30.46090° & W086.79498°, M-35 Truck, Site TT-2

Range A-78, TT-16, GPS N30.46436° & W086.78774°, M-4 Tank

Range A-78, GPS N30.46067° & W086.78355°, Bridge Track

Target Site (unspecified material) at B-7

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APPENDIX E

MUNITIONS RESIDUE – RANGE SUSTAINABILITY PRACTICES

MUNITIONS RESIDUE – RANGE SUSTAINABILITY PRACTICES

It is possible to achieve environmentally compatible installations without compromising military readiness or training through the use of technologies that aid in site characterization, remediation, and contaminant alleviation. AAC/EMR has developed Eglin Standard Operating Procedures for environmental sampling, which have been reviewed and approved by the USEPA Region 4 office and the FDEP. The procedures should be reviewed to determine suitability of procedures for Air-to-Ground Gunnery (ATGG) related purposes. Adequate procedures should be instituted for TAs A-77, A-78, A-79, and B-7. If, however, additional practices are warranted, development and implementation of techniques should be considered. This section provides an overview of other potential sampling strategies and range sustainability practices that could be applied to the ATGG test areas.

SAMPLING STRATEGIES

Residues from explosives, improper disposal practices, and incomplete detonations of munitions can subsequently contaminate soil and groundwater. Proper characterization, through sampling, of potential contamination risks is an essential part of effectively assessing possible environmental or health impacts. Characterization will also allow Eglin to understand carrying capacity of individual ranges and will aid greatly in future planning/sustainability efforts. Characterization should lead to appropriate remedial action and safety precautions during testing and training exercises to reduce the potential for future environmental impacts.

Sampling Plan

The first step in assessing explosive contamination is to identify the munitions and their degradation products in the soil and groundwater. A sampling plan should be developed to include all of the currently accepted practices for sampling, analysis, and management of environmental data. The sampling plan should address relevant aspects of explosive contamination that includes the issues involved with the characterization of explosives material and detailed descriptions of procedures and methodologies to complete these related tasks (Thiboutot, et al., 2002). The area must first be delineated to include the entire site or several areas within the site. Appropriate site-specific sampling strategies must be selected. Contaminant distribution is site specific and depends upon several factors, including explosives use in the area, the physical and chemical characteristics of the contaminant involved, soil type, and geology and hydrogeology of the site.

Safety clearance of the area should be performed prior to sampling for potential contamination. The chemical, physical and toxicological properties of high explosives (RDX, HMX, and TNT) differ from the more commonly seen environmental contaminants. Additionally, many ranges contain large amounts of unexploded ordnance on the surface or buried in soil. Special safety procedures, management, and sampling methodologies of explosive sites are detailed in the "Guide for Characterization of Sites Contaminated with Energetic Materials" (Thiboutot et al., 2002).

Soil Sample Collection – Munitions Residue

The behavior of explosives residues in the environment must be considered during all sampling, preparation, and analysis of soils or water. Explosives are usually solid at ambient temperatures and residues are of different particle size and typically dissolve slowly in aqueous solution. The highest levels of contamination are most likely to occur directly on or near the soil surface. However, contaminant spread may vary significantly, resulting in heterogeneous distribution of chemicals on training and test ranges. For example, one study revealed that contaminant concentrations varied by as much as 200 percent from surface soil samples collected within 120 centimeters of each other (Jenkins, et al., 1996).

The objective of the sampling plan should be to obtain representative samples, meaning they represent a valid estimation of the average concentration for the area of concern. Scenarios often used are: (1) the identification of a suspected surface hot spot and (2) the average surface concentration over a specified area (test range). Past studies have shown that the collection of discrete samples at a specific number of training locations are often futile due to the short-range spatial variability that exists for explosives in surface soils. Composite sampling of 500 grams or larger is now recommended when characterizing the surface soils at explosives-contaminated areas. For smaller impact areas (1 meter by 1 meter), 30 or more soil samples of the same amount should be randomly collected. For large impact areas, systematic grids can be used to establish sampling nodes where areas of between 3 and 10 meters square are randomly sampled by obtaining 50 or more soil samples (Thiboutot, et al., 2002). Once surface hot spots are determined, subsurface sampling is recommended in a continuous vertical profile within the first meter. Beneath 1 meter, it is suggested that samples be collected at meter intervals until the groundwater table is reached (Thiboutot, et al., 2002). To determine accurate chemical concentrations in all media, care must be exercised in the collection and handling of all samples, since sampling error has been found to be a significant factor in characterization error (Jenkins, et al., 1996).

Groundwater Sample Collection – Munitions Residue

Characterization of explosive contamination on large test ranges can be aided by the sampling of groundwater. A sampling plan that initiates groundwater sampling during the initial phases of site assessment may reduce the costs associated with sampling and analysis. Should contaminants be detected in groundwater, a more detailed sampling plan to identify sources in the surface and subsurface soils should be initiated. Well installation should be performed by a hydrogeologist after explosives clearance has been established. Groundwater sampling is performed to detect the presence of contaminants or to monitor contaminant concentrations at specific areas over time. When trying to establish the presence of groundwater contaminants, sampling can be performed using a variety of simple techniques. The most common and economical method is to use a dedicated or disposable bailer. When groundwater contaminant plumes are being monitored, low-flow sampling is recommended to enhance the representativeness of the samples.

Field Screening Methods

Field screening allows for the analysis of samples on site. Reliable methods can reduce the manipulating, storing, and transporting of samples that contain explosive residue. Contaminants can be assessed on site in real time, thereby decreasing the number of samples needed to characterize a site. However, laboratory analysis reveals more accurate analytical data than field methods. For this reason, samples that show a positive response in the field should be validated with laboratory methods. Field screening methods are used to establish safety levels for the manipulation of potentially contaminated samples in relation to a 10 percent threshold safety limit, screen soil or water for the presence of residues before sending to the lab for analysis, and optimize the efficiency of sampling required when delineating an area and to determine depth of contamination in both soil and groundwater (Thiboutot, et al., 2002).

Colorimetric Field Methods

Several field colorimetric methods are available to detect explosive residues that may be present on military sites. Colorimetric methods result in colored end products that can be easily monitored by visual inspection or with the use of portable spectrophotometers. Previous studies have shown that these methods can be adequately evaluated by use of this method (Thiboutot, et al., 2002). The methods are easy to use, portable, and rapid, use only low-toxicity solvent, assess over a large analytical range, and have low detection limits. The spectrophotometric field colorimetric methods have shown strong correlations with standard laboratory methods. The advantage of the visual field method is its ability to rapidly screen for the presence and estimate concentrations of munitions residues in soil.

Laboratory Methods

Many analytic techniques have been used to determine munitions residues in environmental matrices. As numerous compounds are potentially present that can have similar physical and chemical properties, analytical methods have included a chromatographic separation. For routine analysis of soils and waters from potentially contaminated sites, a suitable method should provide simultaneous determination of all common secondary explosives and their manufacturing impurities and environmental transformation products, utilize standard laboratory equipment, and provide detection capability at or below criteria established to protect human health and the environment (Walsh, et al., 1995). The U.S. Environmental Protection Agency (USEPA) recommends the use of a reversed-phase high-performance liquid chromatographic (RP-HPLC) procedure, issued by the USEPA Office of Solid Waste as SW846 Method 8330.

REMEDIATION STRATEGIES

There are a variety of remediation technologies currently available to deal with munitions-related contamination. The specific technology chosen will depend on a variety of factors, including extent of contamination, potential for contaminant migration, hydrologic and geologic conditions at the site, and cost. Several of the most commonly used remediation technologies used today are discussed below.

Phytoremediation serves as an ecologically sound remediation tool for explosives-contaminated soil and groundwater. It is a biological process in which living plants are utilized to remove, degrade, accumulate, or contain contaminants in the environment. Phytoremediation has been shown to be less costly than the more common processes, such as excavation or thermal treatment. Optimal conditions for phytoremediation include large land areas that have low to moderate contaminant concentrations with shallow soils and water tables. Phytoremediation is usually limited to a 3-foot depth for contaminated soils and a 10-foot depth for contaminated groundwater. The process involves the breaking down of hazardous into nonhazardous substances or concentrating hazardous substances within the plant's tissues. Concentration of chemicals in the plant's tissues may introduce them into the food chain should animals or insects consume the material. However, remedial sites implementing phytoremediation are taking steps to prohibit grazing animals and birds by erecting fences and overhead nets. Biodegradable pesticides are used to eradicate rodents and insects in the areas, and plants are harvested prior to seeding and flowering to limit the availability of plant food.

Harvesting and disposal of plant tissue that has metabolized and accumulated environmental contaminants must be tested. Should the testing reveal that harvested material has been metabolized into nonhazardous constituents, the material could be mulched, composed, or reused on site. Should plant tissue analysis reveal that tissues contain hazardous constituents, they must be disposed of as hazardous waste. Even though phytoremediation may produce hazardous materials, it remains a cost-effective method as it causes little environmental disturbance and successfully reduces soil and groundwater contaminants.

Bioremediation is "the use of living organisms to reduce or eliminate environmental hazards resulting from accumulations of toxic chemicals and other hazardous wastes" (Gibson and Sayler, 1992). It is a preferred method of waste disposal over soil removal due to the reduced cost and decreased impact on the environment. Some contaminated areas would require that large amounts of topsoil be removed if bioremediation were not available. Organisms that live within the soil can metabolize many wastes. However some problems inherent in bioremediation include nutrient availability, growth rates, interactions, metabolic pathways, and misrouting of metabolites in organisms.

Common bioremediation methodologies include:

- Composting – Composting treats highly contaminated soils by adding bulking agents such as straw, sawdust, bark, or woodchips and organic amendments (manures, fruit and vegetable wastes) to the soil. The mixture is formed into piles and aerated in a contained system or by mechanically turning the pile. Bulking agents improve workability and aeration, whereas the organic amendments provide a source of metabolic heat. The optimal environment obtained includes elevated temperatures (>30°C), abundant nutrients, increased moisture (>50 percent), ample oxygen, and a neutral pH (Craig, et al., 1995). Decomposition of hazardous materials occurs at higher temperatures caused by the increase in biological activity in the treatment area. Irrigation techniques are employed to optimize nutrient and moisture control and enclosing systems allows for air emission control. One disadvantage to composting is the increase in material from added bulking agents and amendments.

- Bioslurry – Bioslurry treatment entails excavating contaminated soils or sludge and mixing them with water in a tank or lagoon to create slurry that is mechanically agitated. Nutrients are added to the mix and the levels of oxygen, pH, and temperature are controlled. Following treatment, soils are separated from the slurry and are recycled or treated and disposed of. Slurry systems have the highest operating costs in comparison to other bioremediation treatments.
- Land farming – During land farming bioremediation, contaminated soil is placed in a thin layer (approximately 12 –to 18 inches deep) in clay or plastic-lined treatment beds. Nutrients such as nitrogen and phosphorus are added to the soil. The treatment beds are furnished with irrigation, drainage, and soil/water monitoring systems. Land farming is an easy and cost-effective method of bioremediation that has been commonly used in the past. Disadvantages include the low level of process control and the fact that the treatment method is land intensive due to the thin layer of soil used for aerobic treatment (Craig, et al., 1995).

Carbon adsorption, another common technology, removes organic contaminants from water by absorbing the organics through electrical attraction, Van der Waal's forces, and the compound's affinity for carbon and its hydrophobic nature. Activated carbon may remove more than 99.5 percent of the munitions (RDX, TNT, HMX) from "pink water" (wastewater produced from the manufacturing of explosives). The disadvantage of carbon absorption is the high maintenance costs. Spent carbon must be disposed of after use. It was estimated that disposal costs for treating 1,000 gallons of pink water was $20 in 1992. Cleanup of contaminated ground and surface waters are estimated to be less than that of pink water based on lower concentrations of explosives (ANRCP, 1998).

In situ soil flushing is a remediation technology that floods contaminated soils in the surface with a washing solution to flush out contaminants.

Thermal desorption heats soil to vaporize contaminants with low boiling points. Vaporized contaminants are then captured and removed for further treatment or destruction.

Air sparging injects air into the saturated zone (that part of subsurface that is soaked with groundwater) to remove hazardous contaminants.

Soil washing uses water or a washing solution and mechanical processes to scrub excavated soils and remove hazardous contaminants.

Oxidation is a common method used to treat organic compounds. Chemical oxidation is done by the addition of oxidizing agents such as ozone, peroxide, or chlorine. Ultraviolet (UV) radiation may is also used, often in combination with a chemical oxidant.

Recycling is an important control in minimizing lead migration in the use of lead reclamation on firing ranges. This action will also reduce remediation costs. Ranges with similar conditions to that of Eglin (high precipitation and acid soils) may require more frequent recovery programs because the potential for lead migration is greater under these conditions. State regulations may

require material being sent for recycling have a minimum lead content. Common lead removal activities include (USEPA, 2001):

- Hand raking or sifting
- Screening
- Vacuuming
- Soil washing (wet screening, gravity separation, pneumatic separation)

Workers at the McAlester Army Ammunition Plant have shown that artillery rounds can be recycled. Components from more than a half-million obsolete 105-mm and 8-inch artillery rounds are recycled using melt-out operations. The plant uses 24 autoclaves to melt out 288 projectiles at a time. Following melt-out, the explosives inside are transferred to a series of kettles for collection of explosives. The explosives are drained out of the kettles onto water-chilled conveyors. The explosive flakes are packaged and stored for later use in open burning and open detonation operations, and metal parts are sold as scrap (USAEC, 1999).

INHIBITED MIGRATION STRATEGIES

Lime addition. Soils with the acidic conditions (as those shown on Eglin) should be of particular concern because the increased breakdown and mobility of lead, copper, and zinc. One BMP to control metal migration is to spread lime around earthen backstops, sand traps, and shotfall zones. Spreading of the lime neutralizes the acidic soils, thus reducing the degradation potential. The recommended soil pH for ranges as proposed by the National Sports Foundation is 6.5-8.5. Spreading 50 pound (sandy soils) or 100 pound (clay soils) bags of granulized or palletized lime per 1,000 square feet of range will raise the soil pH approximately one-pH unit for a period of one to four years (USEPA, 2001). The market price of lime is ~$2 to $4 per 50 pound bag. Soil pH should be monitored annually as the effectiveness of the lime decreases over time and routine applications will be necessary.

Phosphate addition. Phosphate spreading is recommended where lead is widely dispersed in range soils or there is an increased potential for vertical lead migration to groundwater (such as low soil pH and shallow water table). Unlike lime addition, the goal of phosphate treatment is not to change soil pH but to bind lead particles. This process decreases the migration potential that can migrate off-site or into the subsurface. Phosphate can be purchased as phosphate rock (pure form) or as a lawn fertilizer. The average fertilizer contains 25 percent phosphate. Twenty pounds of phosphate should be spread per 1,000 square feet of area. The average cost of lawn fertilizer is ~$7 per 40 pound bag. It is not recommended to use fertilizers near water bodies as it can increase algal blooms. Rock phosphate should be used if surface water is nearby.

Control of runoff. BMPs for controlling soil erosion and surface water runoff can control or prevent migration of range contaminants. Factors that influence the amount of contaminants carried to surface waters and off site are the amount of residues on ranges and the velocity of the runoff. Runoff velocity can be controlled using the following BMPs (USEPA, 2001):

- ***Vegetative ground cover.*** The use of vegetative ground cover (such as grass) can minimize contaminant runoff from land surface during heavy rainfall. Fescue grasses form mats that are optimal in controlling erosion. Ground cover absorbs rainwater, which can reduce the contaminant-water contact time. Grasses yield the most control where impact areas are sloped and water runoff and soil erosion is more likely. It is recommended that quick growing turf grass (fescue or rye grass) be used and vegetation that attracts birds and other wildlife should be avoided to prevent contaminant ingestion.
- ***Mulches and compost.*** Mulches and compost contain acids that naturally sorb lead out of solution and reduce its mobility. TNT has also been shown to be immobilized by humic materials. Mulches and compost can also reduce the amount of water that comes into contact with munitions residues. It is recommended that the material be spread at least 2 inches thick and maintained periodically to maintain effectiveness. Most compost and mulch is acidic; therefore, if these materials are added to ranges with low pH values, it may be necessary to increase the application of lime to control pH.
- ***Engineered runoff controls.*** Runoff controls should be of the greatest concern on a range such as Eglin, which receives heavy annual rainfall, due to the increase in migration of contaminants. The impact of rainfall is increased in areas that are rolling or have sloped terrain. Examples of runoff controls include filter beds, detention/ containment traps, dikes/dams, and ground contouring.

MODIFICATION IN MUNITIONS

Green Energetics. Philip Eaton and Mao-Xi Zhang, chemists at the University of Chicago, achieved the synthesis of octanitrocubane, a compound that could be one of the most powerful nonnuclear explosives known (Zhang, et al., 2000). The compound is twice as powerful as trinitrotoluene (TNT) and thought to be 20 to 25 percent more effective than high melting explosive (HMX). Its by-products will not detrimentally impact the environment, as it burns into carbon dioxide and nitrogen. The Army now is considering how to make the compound in its laboratories in sufficient quantities for real-world testing (Kortus, et al., 2000).

Lead-Free Double Base Propellants. The fiscal year 2002 Defense Appropriations Conference Report included $6.7 million in funding for the Indian Head Naval Surface Warfare Center; a portion of which funds the Green Energetics Program. Engineers at Indian Head have developed a family of double base propellants that do not have lead ballistic modifiers. Lead ingredients have been used in double based propellants since the 1940s. As a result of the research, a lead-free propellant formulation is being further developed at the Radford Army Ammunition Plant for the 2.75-Inch (Mk-90) Rocket Motor as replacement for the NOSIH-AA-2. A lead-free propellant is also being developed for Navy Aircrew Escape Propulsion Systems. During test firings, both systems showed improved combustion stability over the conventional propellant (NAVSEA Indian Head, 2002).

Green Missiles. The Army Aviation and Missile Command at Redstone Arsenal is leading a program to develop technologies that will eliminate major sources of toxic/hazardous materials used in missile systems. Indian Head Naval Surface Warfare Center is working on a portion of the project that focuses on eliminating lead in smoke propellants. Indian Head has developed several systems that contain no lead or other highly toxic materials. This project is a joint effort

between the Army, Navy, and Air Force and is sponsored by Strategic Environmental Research and Development Program (SERDP) (NAVSEA Indian Head, 2002).

Green Bullets. Lead has been the material used for bullets because of its low cost, availability, and performance. However, due to the growing concern of lead contamination to the environment, other materials with reduced human and environmental impacts are being formulated for ammunition use. Tungsten, a nontoxic metal that is denser than lead, and tin, a nontoxic metal used in food and beverage containers, are being implemented as alternatives for lead bullets.

The Army recently began producing lead-free bullets at the Lake City Ammunition Plant in Missouri. The copper-jacketed 5.56-millimeter (mm) bullets, standard for the M-16 rifle, will be produced with a tungsten-tin or nylon-nylon core instead of lead. The Army also will replace the 9-mm pistol round, the 7.26 machine gun round, and the .50-caliber rounds with lead-free versions. The tungsten-tin bullets pose no risk of lead contamination and could reduce environmental compliance burdens at small range arms ranges. Table E-1 shows an annual cost comparison of lead versus tungsten-tin bullets used at the Department of Energy Oak Ridge Reservation Outdoor Range Training Facility (Bogard, et al., 1999).

Table E-1. Cost Comparison for Lead versus Tungsten-Tin Bullets

Costs ($)	Slug Composition	
	Lead	Tungsten-Tin
Ammunition	2,500	7,500
Maintenance and Cleanup	48,000	2,500
Total Cost	50,500	10,000

Notes: Ammunition cost is based on 10,000 rounds per year. "Cleanup" refers to periodic activities such as the recovery of slugs from bullet traps.

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APPENDIX F

CHEMICAL FATE AND TRANSPORT AND TOXICITY ASSESSMENT OF METALS IN ORDNANCE

Table F-1. Chemical Fate and Transport and Toxicity Assessment of Metals in Ordnance

Chemical/USEPA Carcinogenicity Class	Environmental Fate and Transport	Toxicity
Aluminum D-Not classifiable	Aluminum occurs naturally in soil and water and cannot be broken down in the environment. Wind-borne particles settle to the ground or are washed out of the air by rain. Aluminum in soil is taken up into plants; however, it not known to bioconcentrate in the food chain. An exception is tea plants, which can accumulate aluminum. Most aluminum-containing compounds do not dissolve in water unless the water is acidic. When acid rain falls, aluminum compounds in the soil may dissolve and enter lakes and streams. Since the affected bodies of water are often acidic themselves from the acid rain, the dissolved aluminum does not combine with other elements in the water and settle out as it would under normal (i.e., nonacidic) conditions (ATSDR, 1999).	Low-level exposure to aluminum from food, air, water, or contact with skin is not thought to harm health. People who are exposed to high levels of aluminum in air may have respiratory problems including coughing and asthma from breathing dust. Some studies show that people with Alzheimer's disease have higher levels of aluminum in their brains. Infants and adults who received large doses of aluminum developed bone diseases (ATSDR, 1999). Laboratory studies with rats and rabbits showed that aluminum dust caused adverse effects to the respiratory system, spleen, kidneys, and blood vessels. Ingestion of 1,400 mg/kg showed effects to blood and bone. Chickens developed rickets (TOXNET, 2002).
Chromium Chromium(VI) in air A-Human carcinogen	Chromium(III) occurs naturally in the environment and is an essential nutrient. Chromium(VI) and chromium(0) are generally produced by industrial processes. In air, chromium compounds are present mostly as fine dust particles (chromium[III] and chromium[VI] forms). Although most of the chromium in water binds to dirt and other materials and settles to the bottom, a small amount may dissolve in the water. Fish do not accumulate much chromium in their bodies from water. Most of the chromium in soil does not dissolve easily in water and can attach strongly to the soil. A very small amount of the chromium in soil, however, will dissolve in water and can move deeper in the soil to underground water (TOXNET, 2003).	Chromium(III) is an essential nutrient. Breathing high levels of chromium(VI) can cause irritation of the nasopharyngeal airway. Ingestion of large amounts of chromium(VI) can cause adverse effects to the stomach to include ulcers, convulsions, kidney and liver damage, and even death. Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted (ATSDR, 2003). Several studies have shown that chromium(VI) compounds can increase the risk of lung cancer. Animal studies have also shown an increased risk of cancer.

Table F-1. Chemical Fate and Transport and Toxicity Assessment of Metals in Ordnance Cont'd

Chemical/USEPA Carcinogenicity Class	Environmental Fate and Transport	Toxicity
Copper D-Not classifiable	Copper can enter the environment on military ranges from the corrosion of brass weaponry or small arms ammunition. Copper is also found naturally in the environment. The majority of copper released to soils becomes bound to soils or organic matter. Much of the copper discharged into waterways is in particulate matter and settles out, precipitates out, or adsorbs to organic matter, hydrous iron and manganese oxides, and clay in sediment or in the water column. A significant fraction of the copper is adsorbed within the first hour, and in most cases, equilibrium is obtained within 24 hours. Copper binds primarily to organic matter in estuarine sediment, unless the sediment is organically poor. The ability of copper to leach from soils is dependent upon the acidic content of rainfall through the soil (ATSDR, 1990). One study showed that copper became mobile only following rainfall that was acidic at a pH of <3. Thus the primary transport pathway of copper would be from leaching through the acidic to slightly acidic permeable sandy soils. Because copper binds so strongly to suspended particles and sediments, it typically does not enter groundwater. Because copper adsorbs to organic matter, carbonates and clay in the environment, its bioavailability is reduced.	Copper is essential to human health, but ingesting gram doses of copper salts has resulted in gastrointestinal, liver, and bladder effects. Gastrointestinal disturbance and liver toxicity have resulted from long-term exposure to drinking water containing 2.2-7.8 mg/L. Workers exposed to copper dust experienced gastrointestinal problems, headaches, and vertigo (ATSDR, 1990). Copper sulfate and other copper compounds are used as algaecides with the free copper ions acting as the lethal agents. Single-cell and filamentous algae and cyanobacteria are very susceptible to the effects, which include reductions in photosynthesis and growth, loss of photosynthetic pigments, and death. Sensitive algae can be affected at low concentrations of free copper in freshwater. It is highly toxic to fish and has been lethal to trout even at recommended applications. Copper is acutely toxic to a variety of freshwater species ranging from sensitivities of 17.74 µg/L for pike minnow species to 10,240 µg/L for stonefly species (USEPA, 1986). In laboratory studies, animals exposed to copper showed liver and kidney death at doses > 100 mg/kg/day. Copper has been shown to be poisonous to terrestrial organisms in soil (e.g., earthworms). Extensive use of copper containing fungicides in orchards has been known to eradicate soil organisms (TOXNET, 2003). Copper sulfate is fairly nontoxic to birds, with the lowest lethal dose shown at 1,000 mg/kg in pigeons and 600 mg/kg in ducks. The bioconcentration factor (BCF) of copper in fish obtained in field studies is 10–100, indicating a low potential for bioconcentration. The BCF is higher in mollusks, especially oysters, where it may reach 30,000, possibly due to the fact that they are filter feeders and copper concentrations are higher in particulates than in water. However, there is abundant evidence that there is no biomagnification of copper in the food chain (ATSDR, 1990).

Table F-1. Chemical Fate and Transport and Toxicity Assessment of Metals in Ordnance Cont'd

Chemical/USEPA Carcinogenicity Class	Environmental Fate and Transport	Toxicity
Lead Compounds B2-Probable human carcinogen	Lead oxidizes when exposed to air and dissolves when exposed to acidic water and soil. Lead bullets, bullet particles, or dissolved lead can be moved by stormwater runoff, and dissolved lead can migrate through soils to the groundwater. The primary cause of lead mobilization from ammunition is from metallic lead to form Pb^{+2} (dissolved from the crust of ammunition) and a combination of oxidized compounds. Acidic soils tend to increase lead oxidation and dissolution (ATSDR, 1999a). The downward movement of elemental lead and inorganic lead compounds from soil to groundwater by leaching is very slow under most natural conditions except for highly acidic situations. Soils low in clay (sandy), and containing organic matter, iron, and aluminum oxides, and are acidic, are all conditions that are favorable to lead mobility and leachability. Plants and animals may bioconcentrate lead. Lead partitions primarily to sediments but becomes more bioavailable under low pH, hardness, and organic matter content (among other factors). Lead bioaccumulates in algae, macrophytes, and benthic organisms, but the inorganic forms do not biomagnify. (ATSDR, 1999).	Lead is cancer causing and adversely affects reproduction, liver, and thyroid function, and disease resistance. Plants and animals may bioconcentrate lead but biomagnification has not been detected (ATSDR, 1999a). Fish exposed to high levels of lead have shown muscular and neurological degeneration and destruction, growth inhibition, death, reproductive problems, and paralysis. Birds and mammals suffer effects from lead poisoning such as damage to the nervous system, kidneys, liver, sterility, growth inhibition, developmental retardation, and detrimental effects in blood (USEPA, 2003). Lead poisoning in higher organisms has been associated with lead shot and organolead compounds. The main potential ecological impacts of the wetland contaminants result from direct exposure of algae, benthic invertebrates, and embryos and fingerlings of freshwater fish and amphibians to lead. Potential endpoints include growth reductions and impaired survival (USEPA, 2003). In the form of simple salts, lead is acutely toxic to freshwater organisms at concentrations above 40 mg/L and for marine organisms above 500 mg/L (WHO, 1989). Calves pastured on a target area of a military shooting range showed acute lead poisoning that included symptoms of maniacal movements, drooling, rolling eyes, and convulsions. Most calves died, and blood levels of lead were as high as 940 µg/L. Concentrations of lead in the grass and soil were 29,550 mg/kg and 3,900 mg/kg, respectively (Braun, et al., 1997). Birds including fowl, ducks, geese, and pigeons are all prone to lead poisoning. All exhibit anorexia and ataxia, followed by excitement and loss of function. Egg production, fertility, and hatchability decrease, and mortality is high (TOXNET, 2003). Lead shot is highly toxic to birds; ingestion of a single pellet can be fatal to some birds (WHO, 1989).

Table F-1. Chemical Fate and Transport and Toxicity Assessment of Metals in Ordnance Cont'd

Chemical/USEPA Carcinogenicity Class	Environmental Fate and Transport	Toxicity
RDX C-Possible Human Carcinogen	RDX will be moderate to highly mobile in soil and will break down (biodegrade) under anaerobic conditions, exhibiting a half-life of 12 days. It remains resistant to degradation when exposed to air (aerobic). If released to the atmosphere, RDX will exist as particulate and ultimately be removed by dry deposition. In water, RDX exhibits direct photochemical breakdown, as it does in the atmosphere (Hoffsommer et al., 1972).	Occupational exposure has caused toxic effects to the central nervous system to include tonic/clonic seizures. Chronic exposure caused convulsions, headache, nausea, vomiting, and unconsciousness. Based on laboratory animal studies showing development of liver tumors, it is thought that RDX may cause cancer in humans. Laboratory studies with mice revealed the central nervous system, kidney, liver, spleen, heart, eyes, and testicles were affected. Freshwater fish are more susceptible to RDX than invertebrates. The lethal concentration to kill 50% (LC_{50}) of the fish ranged from 4.1 to 13 mg/L, depending on the test system (IRIS, 2002). Studies of the northern bobwhite quail established a no observable adverse effect level (NOAEL) of 8.7 mg/kg and lowest observable effect concentration (LOAEL) of 10.6 mg/kg. Effects to blood, spleen, and egg production were noted (USCHPPM, 2002).
TNT C-Possible Human Carcinogen	TNT does not readily hydrolyze or volatilize from water under normal environmental conditions. It migrates slowly through soil and binds to sediments and particulates in the water column. Studies have shown that photochemical reactions of TNT may play an important role in surface soil and water degradation. Microbial degradation showed longer half-lives than photolysis. The half-life was 3 to 4 days in sediment exposed to sunlight and 19 to 25 days when undergoing microbial degradation (TOXNET, 2002).	Human health effects have been recorded from workers involved in the production of TNT at their jobs. Harmful effects include disorders of the blood such as anemia and abnormal liver function. Prolonged exposure to the skin can cause allergic reactions, itching, and rashes. Long-term exposure to TNT has caused cataracts in some individuals. Based on laboratory animal studies showing urinary bladder tumors, TNT had the potential to be a possible human carcinogen. Studies with rats, mice, and dogs showed effects to the male reproductive system, heart, blood and urinary bladder. Studies with the northern bobwhite quail showed an acute lethal dose of 2,003 mg/kg. Adverse effects were seen in the blood cells, liver, urine, and heart (Gogal et al., 2002). Fathead minnow showed behavioral effects when exposed to 0.46 mg/L TNT. In a laboratory microcosm study using daphnid, zooplankton, worms, and algae, exposures of 21 days at $\geq$ 5.6 mg/L produced reductions in daphnid and worms. Exposure of TNT at concentrations of 0.24 to 1.69 mg/L for 60 days reduced fish fry survival, and concentrations of 0.04 to 0.5 mg/L reduced length and weight of fry (TOXNET, 2002).

Table F-1. Chemical Fate and Transport and Toxicity Assessment of Metals in Ordnance Cont'd

Chemical/USEPA Carcinogenicity Class	Environmental Fate and Transport	Toxicity
Zinc B2-Probable Human Carcinogen	Zinc is not found in free form in nature but rather occurs as zinc sulfide or zinc oxide. As with copper, zinc can enter the Eglin environment from corrosion of brass weaponry or small arms. When released to the air, it can bind to soil, sediments, and dust particles. Zinc ions and zinc complexes can migrate to groundwater and move to surface waters. Most of the zinc in soils stays bound to soil particles. Neutral soils between pH of 6 and 7 reduce the availability of zinc to soils. Zinc has been shown to bioaccumulate in fish and other organisms; however, it does not bioaccumulate in plants (ATSDR, 1995).	Zinc is a nutritionally essential element. However, acutely toxic doses (675 to 2,280 µg/L) in drinking water cause nausea, vomiting, diarrhea, and abdominal cramps. Gastric bleeding and anemia were seen from individuals taking zinc sulfate (6.47 mg/kg/day) for one week. Ingestion of zinc chloride has caused burning in the mouth and throat, vomiting, pharyngitis, esophagitis, hypocalcemia, and pancreatitis. Long-term oral doses have caused anemia (ATSDR, 1995). The acute toxic effects of zinc have been observed in the field and laboratory. Sheep consuming zinc (dose unknown) as a result of environmental contamination developed diarrhea, protein in the urine, intestinal and pancreatic lesions, and pancreatic cell degeneration. Ferrets dosed with 850 mg/kg/day showed adverse effects to the kidneys, intestines, and blood. The aquatic toxicity of zinc is dependent upon organism age, size, prior exposure, water hardness, pH, dissolved organic carbon, and temperature. Reported acute toxicity values of dissolved zinc to freshwater and marine organisms are as follows: freshwater invertebrates (0.07 mg/L), water flea (575 mg/L), marine invertebrates (0.097 mg/L), grass shrimp (11.3 mg/L). Acutely lethal concentrations for freshwater fish range from 0.066 to 2.6 mg/L; the range for marine fish is 0.19 to 17.66 mg/L (USEPA, 1980). Zinc has shown adverse reproductive, biochemical, physiological, and behavioral effects on aquatic organisms.

mg/kg = milligrams per kilogram; mg/L = milligrams per liter; µg/L = micrograms per liter

***** Under USEPA's classification of carcinogenicity, a Class A compound is a known carcinogen, a Class B compound is a probable carcinogen, and a Class C compound is a possible carcinogen. A Class D rating means that there is insufficient evidence of carcinogenicity to place the compound in any of the three higher classifications.

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APPENDIX G

USFWS ESA SECTION 7 CONSULTATION FOR THE AIR-TO-GROUND GUNNERY: A-77, A-78, A-79, AND B-7 PROGRAMMATIC BIOLOGICAL ASSESSMENT

INFORMAL

U.S. FISH AND WILDLIFE SERVICE

Endangered Species Act
Section Seven Consultation

for the

AIR-TO-GROUND GUNNERY: A-77, A-78, A-79, AND B-7

PROGRAMMATIC BIOLOGICAL ASSESSMENT

August 2004

PRINTED ON RECYCLED PAPER

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

<	Less than
>	Greater than
4 SOS	4th Special Operations Squadron
6 SOS	6th Special Operations Squadron
9 SOS	9th Special Operations Squadron
15 SOS	15th Special Operations Squadron
16 SOS	16th Special Operations Squadron
16 SOW	16th Special Operations Wing
20 SOS	20th Special Operations Squadron
23 STS	23rd Special Tactics Squadron
38 RQS	38th Rescue Squadron
41 RQS	41st Rescue Squadron
46 TW	46th Test Wing
96 ABW	96th Air Base Wing
720 STGP	720th Special Tactics Group
AAC	Air Armament Center
AAC/EMSN	Environmental Management Directorate, Stewardship Division, Natural Resources Branch
ACC	Air Combat Command
AFB	Air Force Base
AFID	Aviation-Foreign Internal Defense
AFSOC	Air Force Special Operations Command
Al^{+3}	Aluminum
ATGG	Air-To-Ground Gunnery
BMP(s)	Best Management Practice(s)
cal	Caliber
CFR	Code of Federal Regulations
cm	Centimeters
dB	Decibel(s)
dbh	Diameter At Breast Height
dBP	Unweighted Peak Sound Pressure Level in Decibels
DoD	Department of Defense
E	Endangered
EGTTR	Eglin Gulf Test and Training Range
ESA	Endangered Species Act
FL	Florida
ft	Foot (Feet)
GPS	Global Positioning System
HAVE ACE	Ground support training activity that conducts specialized training for Special Forces
HE	High Explosive
HEI	High Explosive Incendiary
HE/TP	High Explosive/Target Practice
IDS	Infrared Detecting System
kg/day	Kilogram per Day
km	Kilometer
lb	Pound
LOAEL	Lowest Observable Adverse Effects Level
MAG	Marine Aircraft Group
MCL	Maximum Concentration Level
MEA	Management Emphasis Area
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams per Kilogram per Day
mg/L	Milligrams per Liter
MgO	Magnesium Oxide

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS CONT'D

mi^2	Square Miles
mm	Millimeter
NAWQC	National Ambient Water Quality Criteria
NEPA	National Environmental Policy Act
NEW	Net Explosive Weight
NOAEL	No Observable Adverse Effects Level
ORNL	Oak Ridge National Laboratory
PBA	Programmatic Biological Assessment
PEA	Programmatic Environmental Assessment
PM_{10}	Particulate Matter With a Diameter Less Than or Equal to 10 Microns
RCW	Red-cockaded Woodpecker
SEALs	Sea-Air-Land Teams
T	Threatened
T&E	Threatened and Endangered
TA(s)	Test Area(s)
TNT	2, 4, 6-trinitrotoluene
TRV	Toxicity Reference Value
U.S.	United States
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UW	Unconventional Warfare
WP	White Phosphorus

1. INTRODUCTION

1.1 PURPOSE

This Programmatic Biological Assessment (PBA) addresses potential impacts from the Preferred Alternative described in the *Air-to-Ground Gunnery (ATGG): A-77, A-78, A-79, and B-7 Programmatic Environmental Assessment (PEA)* to federally listed threatened and endangered (T&E) species present on and within Test Areas (TAs) A-77, A-78, A-79, and B-7 on the Eglin Military Complex, Eglin Air Force Base (AFB), Florida (Figure 1-1). The objectives of this PBA are to:

- Document federally listed T&E species and associated habitat that occur, or may potentially occur, on or near the TAs.
- Identify the activities that have the potential to impact, either beneficially or adversely, those documented species.
- Determine and quantify to the extent possible what effects these activities would likely have on federally listed species.

This PBA, conducted by Eglin's Environmental Management Directorate, Stewardship Division, Natural Resources Branch (AAC/EMSN), is meant to fulfill the requirements of the federal Endangered Species Act of 1973 (ESA) and the National Environmental Policy Act of 1969 (NEPA) for assessing potential impacts to federally listed species. This consultation is programmatic in nature and will address the continuation of activities, and the related management practices, associated with the aforementioned TAs. This PBA completes the consultation process with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the ESA. This PBA is a tiered document, utilizing the ATGG PEA as a reference for additional information.

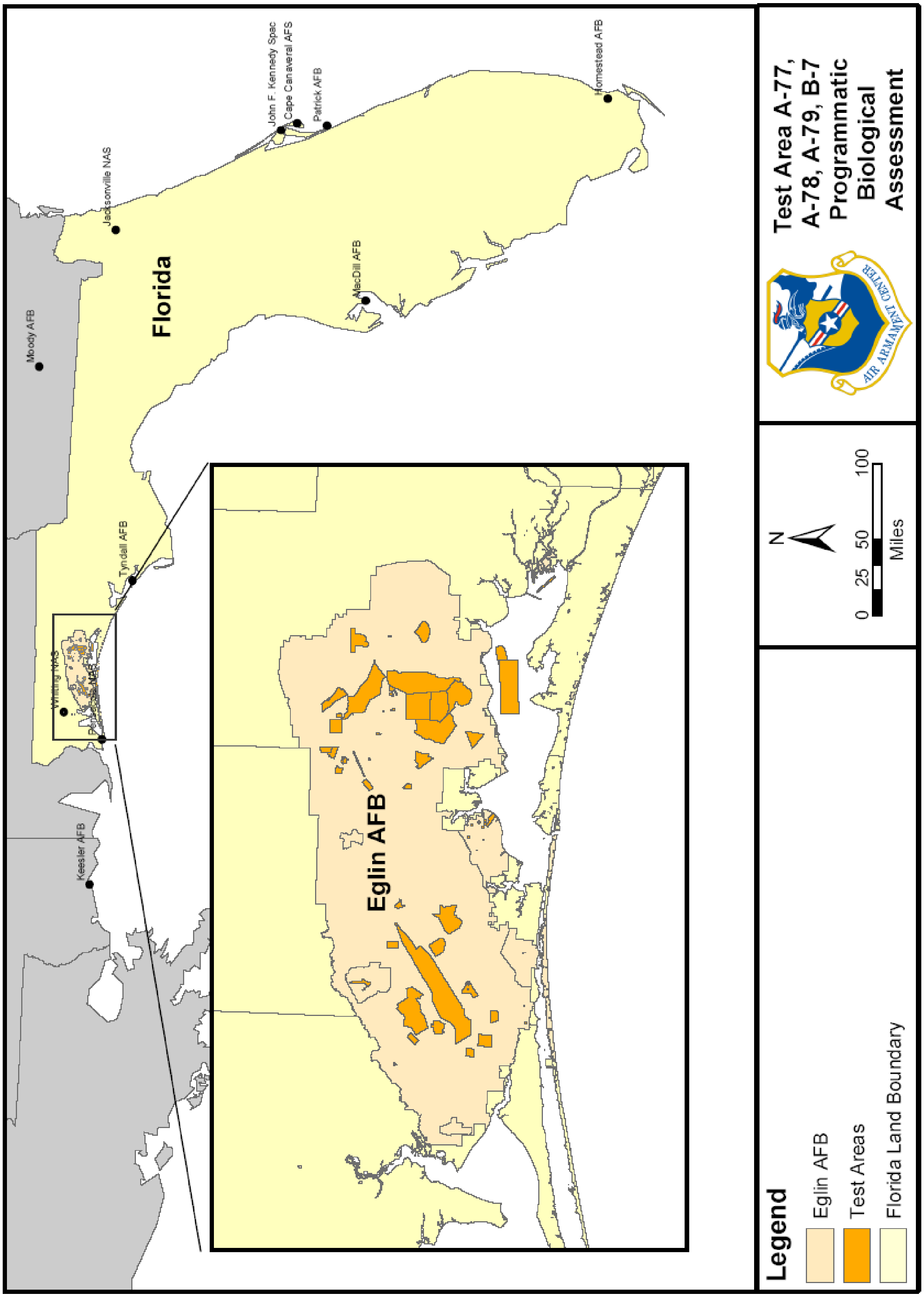

Figure 1-1. The Eglin Military Complex

1.2 FEDERAL SPECIES/HABITAT CONSIDERED

Three T&E species occur within the TAs and were considered for potential impacts in this PBA. Species descriptions are provided in Chapter 3. The federally listed threatened (T) and endangered (E) species considered for potential impacts are as follows.

- Red-cockaded Woodpecker (*Picoides borealis*), E
- Flatwoods Salamander (*Ambystoma cingulatum*), T
- Eastern Indigo Snake (*Drymarchon corais couperi*), T

Potential Issues

Issues identified in the ATGG PEA as potentially impacting biological resources include noise, habitat alteration, and the deposition of chemical materials. Noise is defined as the unwanted sound produced by mission testing or training. Noise may directly inconvenience and/or stress some wildlife species and may cause hearing loss or damage. Scientific data correlating the effects of noise on humans is well documented. However, information regarding the effects of noise on wildlife species is limited. The impacts of noise on wildlife, particularly threatened and endangered species, are a primary concern. Testing and/or training activities involving munitions detonations and the use of gunnery from low-level aircraft may produce noise.

Habitat alterations are described as the physical damage or changes to the habitats of the terrestrial or aquatic environment. Examples of habitat alterations include potential damage to sensitive habitats on and around TAs A-77, A-78, A-79, and B-7 from wildfire related to live fire and pyrotechnic use or from ground movement that may occur.

Chemical materials encompass liquid, solid, or gaseous substances that are released to the environment as a result of mission activities. The environmental analysis of chemical materials describes their possible effects on wildlife. Examples of chemical materials on TAs A-77, A-78, A-79, and B-7 include residue from ordnance and propellants.

1.3 APPLICABLE REGULATORY REQUIREMENTS AND COORDINATION

The following acts were considered in preparation of this PBA.

National Environmental Policy Act of 1969 (NEPA): Encourages harmony between man and the environment, and promotes efforts to better understand and prevent damage to ecological systems and natural resources important to the nation. NEPA requires any action taken, funded, or approved by a federal agency to be reviewed for environmental impacts. If the effects of the action are uncertain, the agency must conduct an environmental assessment, which discloses a proposed action's expected environmental impacts and explores alternatives to the action.

Endangered Species Act of 1973 (ESA): Provides protection for endangered species and designated critical habitats. ESA prohibits jeopardizing threatened and endangered species or adversely modifying "constituent elements" within critical habitat designations. Actions with no

significant impact are **not likely to adversely affect** threatened or endangered species and critical habitat in accordance with ESA. Actions with the significant potential to adversely impact a species or habitat are considered **likely to adversely affect**.

1.4 EGLIN MILITARY COMPLEX PROFILE

The Eglin Military Complex is a Department of Defense (DoD) Major Range Test Facility Base that exists to support the DoD mission. Its primary function is to support research, development, test, and evaluation of conventional weapons and electronic systems. Its secondary function is to support training of operational units. The range is composed of four components.

1) Test Areas/Sites (Figure 1-2)
2) Interstitial Areas (areas beyond and between the test areas)
3) Water Ranges (the Eglin Gulf Test and Training Range (EGTTR) and estuarine and riverine areas)
4) Airspace (over land and water)

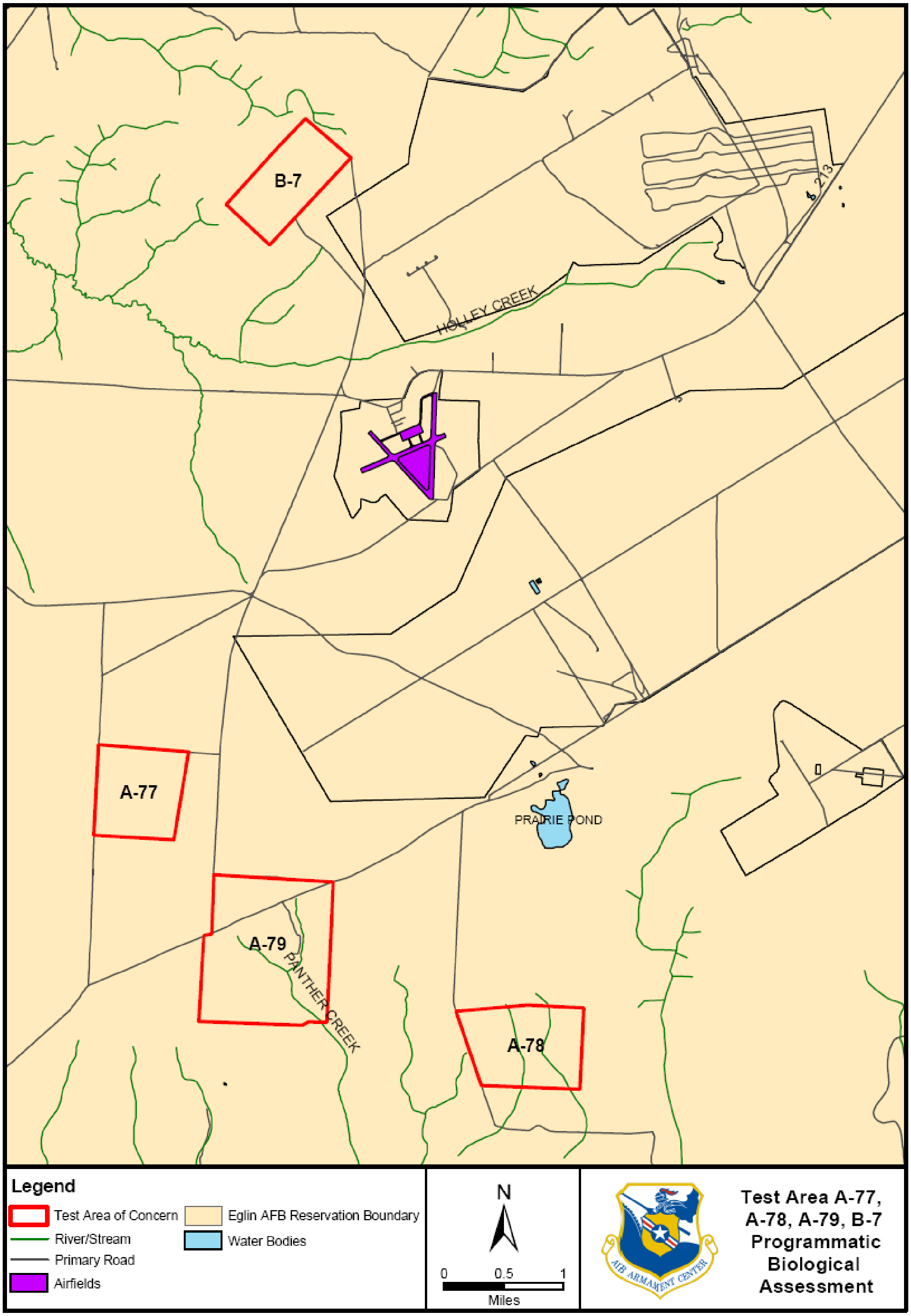

Figure 1-2. Test Areas A-77, A-78, A-79, and B-7

2. DESCRIPTION OF PROPOSED ACTION

2.1 INTRODUCTION

The Air Force Air Armament Center (AAC) has responsibility for the Eglin Military Complex and for all its users, which include DoD, other government agencies, foreign countries, and private companies. For range operations, AAC provides environmental analyses to ensure compliance with Air Force policies and applicable federal, state, and local environmental laws and regulations. AAC includes two wings and four directorates that collectively operate, manage, and support all activities on the Eglin Military Complex. AAC accomplishes its range operations through the 46^{th} Test Wing with support from the 96^{th} Air Base Wing. The 46^{th} Test Wing Commander is responsible for day-to-day scheduling, executing, and maintaining this national asset. The continued DoD utilization of the Eglin Military Complex requires flexible and unencumbered access to land ranges and airspace, which support all of Eglin's operations.

While most missions currently utilizing the TAs have been analyzed individually, a cumulative analysis of potential environmental impacts from all mission activities has not been performed. The programmatic analysis to be performed in this PBA will allow for a cumulative look at the impact on ESA-listed species from all mission activities. By implementing an authorized mission utilization plan on the TAs, sustainable range management will be streamlined and cumulative environmental impacts will be more fully considered.

The baseline level of activity within TAs A-77, A-78, A-79, and B-7, a 100-percent increase in such activity, and the implementation of Best Management Practices (BMPs) (referred to as Management Requirements in this document), represent the Proposed Action and Preferred Alternative of the ATGG PEA. A summary of the activities associated with the Proposed Action is provided in the following narrative. Details of the Proposed Action are discussed further in Chapter 2 of the ATGG PEA.

2.2 CURRENT MILITARY LAND USE

2.2.1 Test Area A-77 Air-To-Ground Tactical Training Area

TA A-77 (Figure 2-1) is an unscored tactical air-to-ground target area located approximately 20 miles west of Eglin Main. This target area is 0.75 square mile (mi^2) and contains various tactical targets such as vehicle convoys, bivouac areas, and gun emplacement. An observation bunker and 2-story close-quarter battle site building (45x30-ft concrete) is located in the northwest corner of this test area. It is used for tactical air-to-ground training in gunnery, bombing, and rocketry delivery. Ground forces use this area as a tactical training area and small arms firing range.

2.2.2 Test Area A-78 Air-To-Ground Tactical Training Area

TA A-78 (Figure 2-2) is an unscored tactical air-to-ground target area located approximately 6 miles northwest of Hurlburt Field. The test area is primarily used for tactical air-to-ground training in gunnery, bombing, and rocketry. This target area is approximately 0.75 mi^2 and

contains various tactical targets such as vehicle convoys, bivouac areas, missile sites, and gun emplacement.

Tactical targets are scattered throughout TA A-78 and are subject to frequent relocation or reconstruction. Ground forces may also use the site for tactical training and a small arms firing range.

2.2.3 Test Area A-79 Side Firing Weapons Systems Test Area

TA A-79 (Figure 2-3) is an unscored tactical air-to-water target area located approximately 7 miles northwest of Hurlburt Field. The target area is an extension to Johnson Pond, which contains a dam and spillway. The area is used for explosives training and acoustical testing.

2.2.4 Test Area B-7 Side Firing Weapons Tactical Training Range

TA B-7 (Figure 2-4) is a sparsely wooded area approximately 1 mile by 0.5 mile wide adjacent to northwest edge of Eglin Main. The test area is used for side firing weapon systems tactical air-to-ground training. One 150-ft resolution target consisting of 6 inches of sandy clay covered with semisolid asphalt and six wood bunkers covered with sandy clay are located within the test area.

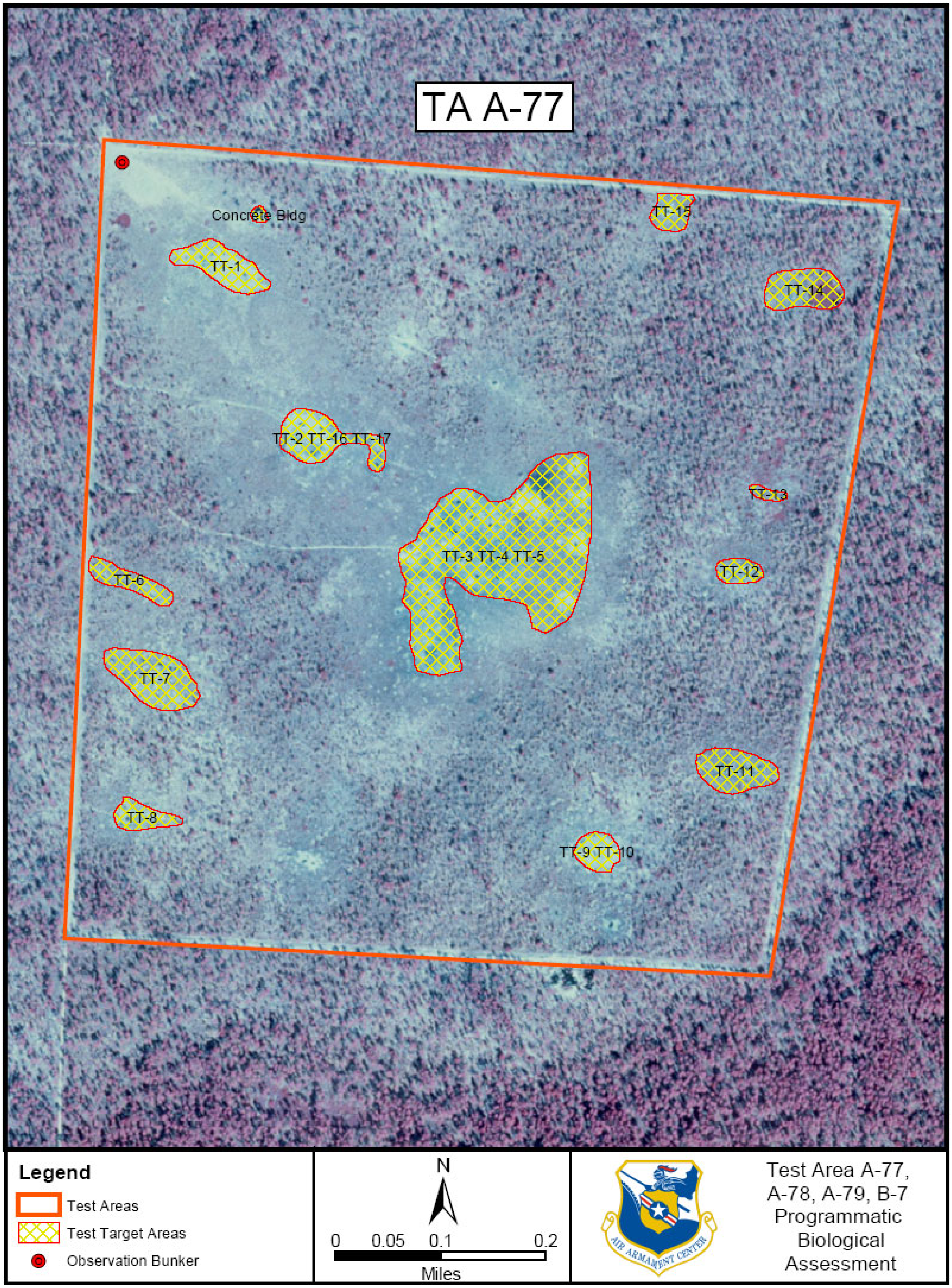

Figure 2-1. Test Area A-77

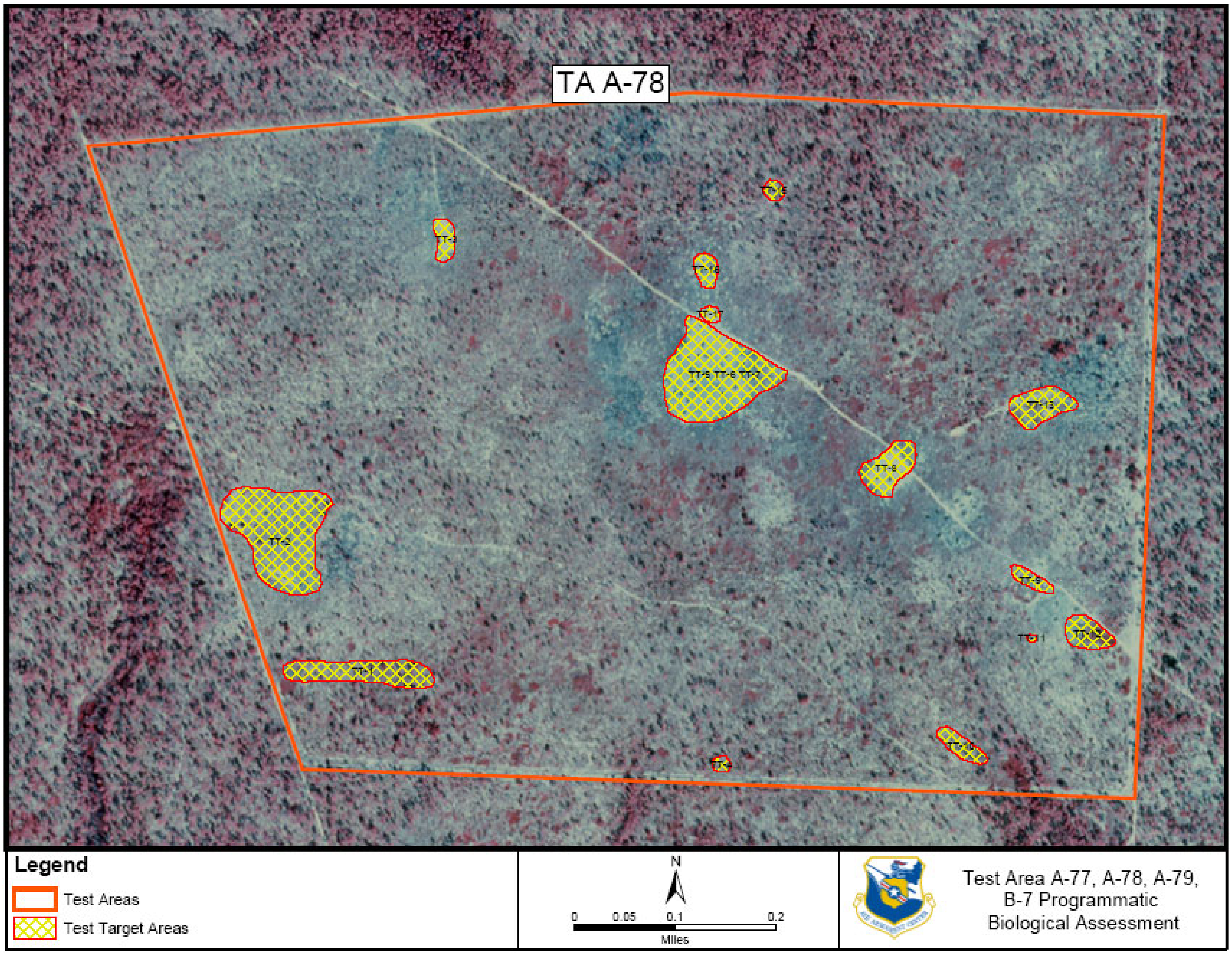

Figure 2-2. Test Area A-78

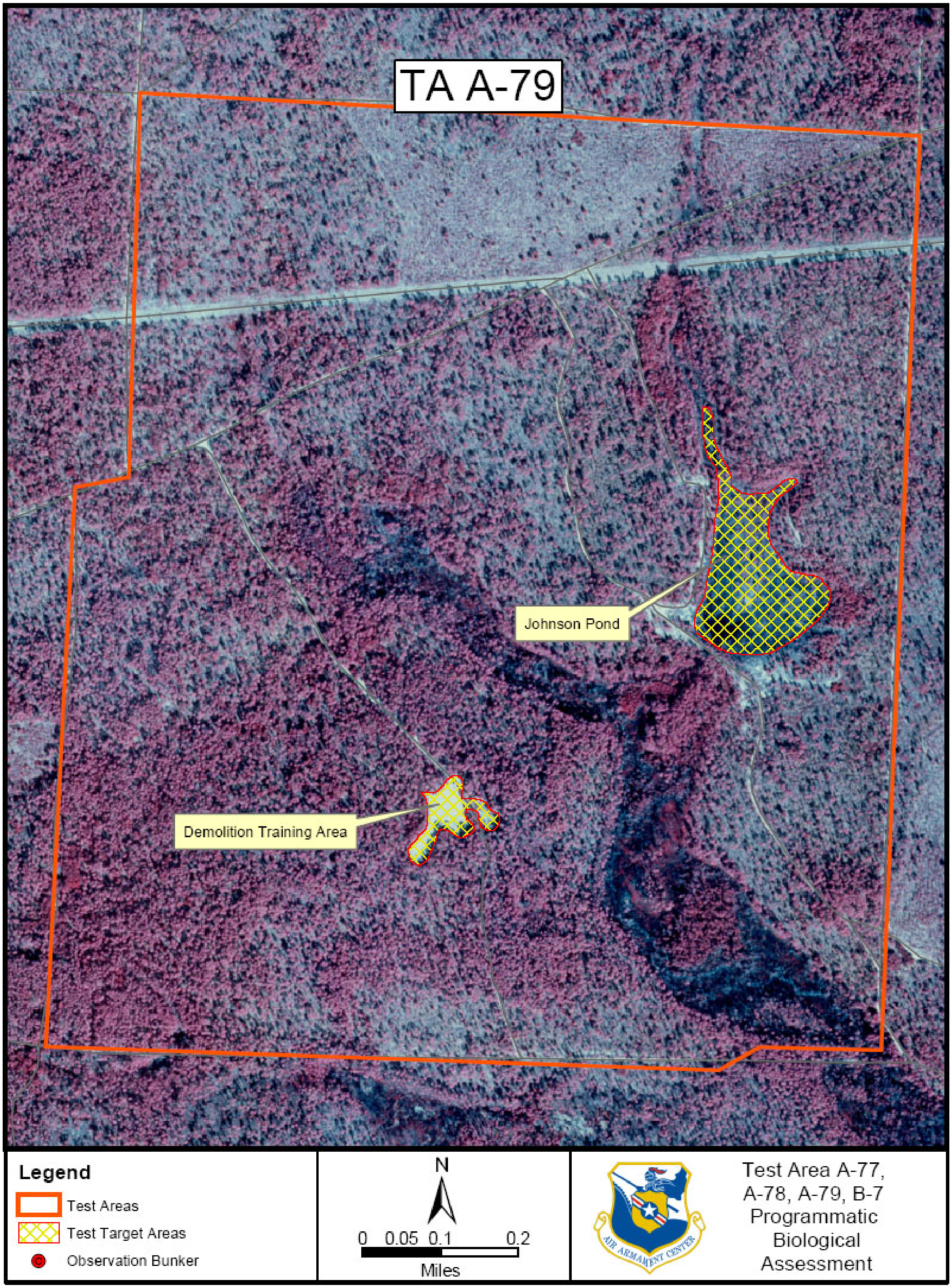

Figure 2-3. Test Area A-79

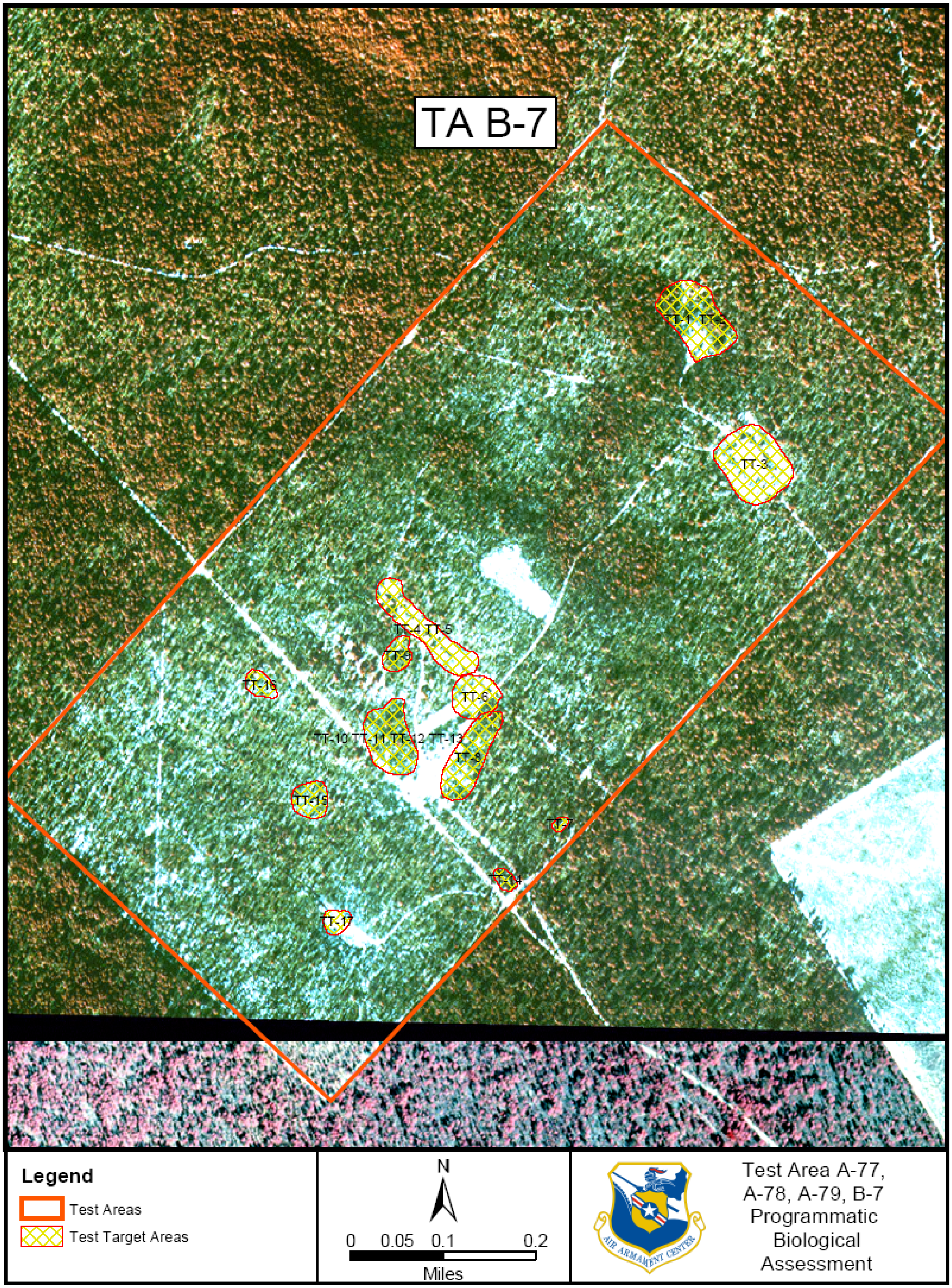

Figure 2-4. Test Area B-7

The purpose of military testing and training missions is to verify, validate, or demonstrate the effectiveness of tactics or the operational capabilities of new or upgraded hardware, software, aircraft, or weapons systems. The baseline period missions involved air-to-ground gunnery and occasional testing or technology demonstrations. User groups and associated mission activities are listed in Table 2-1.

Table 2-1. Test Area User Groups and Associated Military Missions

User Group	Training Mission	Test Area
AFSOC – 16th Special Operations Wing	The 16th Special Operations Wing (16 SOW) at Hurlburt Field, Florida specializes in unconventional warfare. At the direction of the National Command Authorities, the 16 SOW goes into action with specially trained and equipped forces from each service working as a team to support national security objectives. Special operations are often undertaken in enemy-controlled or politically sensitive areas and can cover a myriad of activities. The 16 SOW units are listed below.	A-77, A-78, B-7
16th Special Operations Squadron	The 16th Special Operations Squadron (16 SOS) (a.k.a. “Spectre”) flies the AC-130H gunship. Unique equipment on this highly modified C-130 enables the crew to provide surgically accurate firepower in support of both conventional and unconventional forces, day or night. Primary missions include close air support, armed reconnaissance, and interdiction. The weapon system can also perform perimeter defense, forward air control, surveillance, command and control, and overland or water escort. Ordnance expended includes 40mm (millimeter) High Explosive Incendiary (HEI), 105mm High Explosive (HE), 105 mm white phosphorus (WP), 105mm High Explosive/Target Practice (HE/TP), flares, and chaff. Altitude ranges 3,000–15,000 feet with average being 6,000–9,000 feet. Occasional calls occur for fire, live and dry, with a ground team or other aircraft (MH53s, AC103s, A10s, Apaches). Approximately 500 missions occur per year, with 1–3 missions per day lasting 1.5 hours. All targets on A-77, A-78, and B-7 are used; however, those in the center of the ranges are targeted more frequently. No support equipment is used. Safety is provided by Eglin Mission, Wolfcall, Command Post, and crew.	A-77, A-78, B-7
6th Special Operations Squadron	The 6th Special Operations Squadron (6 SOS) is a combat aviation advisory unit reactivated in 1994 to serve the theater combatant commanders’ advisory needs during peacetime, crisis, or war. The squadron’s wartime mission to advise and train foreign aviation units in airpower employment and sustainment includes three interrelated areas: aviation-foreign internal defense (AFID), unconventional warfare (UW), and coalition support.	A-77, A-78, B-7
8th Special Operations Squadron	The 8th Special Operations Squadron (8 SOS), or “Blackbirds,” flies the MC-130E Combat Talon I. Their mission includes: supporting unconventional warfare missions and special operations forces. The MC-130 aircrews work closely with Army Special Forces and Navy SEALs (sea-air-land teams). In addition, the 8th is able to conduct psychological warfare operations by air dropping leaflets and can drop large bombs for special attack or psychological effect.	A-77, A-78, B-7

Table 2-1. Test Area User Groups and Associated Military Missions Cont'd

User Group	Training Mission	Test Area
4th Special Operations Squadron	4th Special Operations Squadron (4 SOS) (a.k.a. "Spooky") operates 13 AC-130U Gunships. The AC-130U is armed with a 25mm Vulcan cannon (capable of firing 1,800 rounds per minute), a single-barrel, rapid-fire 40mm Bofors cannon and a 105mm Howitzer. As with all previous gunships, the guns are mounted on the left side of the aircraft. However, an advanced fire control system provides greater flexibility in weapons employment.	A-77, A-78, B-7
9th Special Operations Squadron	The 9th Special Operations Squadron (9 SOS) (a.k.a. "Night Wings") flies eleven MC-130P Combat Shadows. The squadron's mission is primarily the covert intrusion of sensitive or denied territory for formation low-level air refueling of special operations helicopters. Flying on night vision goggles and operating with lights out, the 9th SOS also uses the MC-130P for covert infiltration/extraction and re-supply of special operations forces by airdrop or ground extraction.	A-77, A-78, B-7
15th Special Operations Squadron	The 15th Special Operations Squadron (15 SOS) flies the MC-130H Combat Talon II after being activated 1 Oct 1992. The Combat Talon II is equipped with terrain following/terrain avoidance radar, Infrared Detecting System (IDS), dual inertial navigation systems, Global Positioning System (GPS), electronic countermeasures, a sophisticated communications package, and specialized aerial delivery equipment. With crews trained for demanding night and adverse weather operations, the aircraft is capable of penetrating hostile environments at low altitudes in any type of weather.	A-77, A-78, B-7
20th Special Operations Squadron	The 20th Special Operations Squadron (20 SOS) "Green Hornets" flies the MH-53J Pave Low IIIE, the Air Force's most sophisticated helicopter. The primary mission of the 20th SOS is to conduct day or night low-level penetration into hostile enemy territory, to accomplish clandestine infiltration and exfiltration, aerial gunnery support and re-supply of special operations forces throughout the world. These operations involve tactical low-level navigation, night vision goggle operations, airland and airdrop techniques, and overwater operations. The unique capabilities of the MH-53J Pave Low allow the 20th to operate from unprepared landing zones in any type of terrain and from otherwise inaccessible areas. The 20th SOS were among the first units to deploy to Operation Desert Shield in August 1990, 20th SOS crew members and aircraft led U.S. Army AH-64 Apaches in the air strike, opening the air war in Operation Desert Storm.	A-77, A-78, B-7
823rd Red Horse	The 823rd Red Horse is assigned to the Air Combat Command (ACC) at Hurlburt Field. Red Horse squadron is a heavy civil engineering construction unit that is self-contained and can rapidly deploy to support United States (U.S.) forces around the world. Red Horse Airmen have supported operations in Vietnam, Desert Storm, Somalia, and Bosnia. These civil engineering units provide the wartime tasks of force beddown, heavy damage repair, bare-base development, and heavy engineering operations. The 823rd Red Horse conducts demolition training using charges, fuses, detonation cord, and dynamite in a reconditioned clay pit at TA A-79.	A-79

Table 2-1. Test Area User Groups and Associated Military Missions Cont'd

User Group	Training Mission	Test Area
AFSOC – HAVE ACE	HAVE ACE is a ground support training activity that conducts specialized training for Special Forces. Training is conducted as a joint operation to prepare personnel from the Army, Navy, and Air Force. The objective of HAVE ACE missions is to infiltrate and exfiltrate without leaving signature or evidence of troop movement. HAVE ACE training missions utilize TAs A-77 and A-78 and within the reservations western interstitial areas. Interstitial activity consists of armed route escorts and combat survival taking place at least once a week for a four-hour period. A small group of 6–10 personnel is utilized and inserted at Auxiliary Field 6. They move south toward TA A-77 and TA A-78 or west along the Yellow River before moving to TA A-77. During these activities, military vehicles remain on established range roads at night and during black out conditions. Bivouac areas and munitions are not used by HAVE ACE in the interstitial areas. The group simulates recoveries once near the test areas.	A-77, A-78
MINOR USER GROUPS		
Army National Guard	Land navigation, boat and water training, parachute drops, practice raids and ambushes. Activities take place on adjacent test areas (primarily B-75), however, range fan does overlay onto B-7.	Range fan B-7
U.S. Navy	Testing of the DSU-33A/B proximity sensor on air-dropped MK82 bombs, dropped on temporary floating targets. Live-fire training as well as land navigation is conducted by Navy Littoral Warfare Unit on and/or around TAs A-77 and A-78. As pre-deployment training gunships fire 7.62mm and .50cal weapons and F14 and F18 aircraft will fire 20mm at targets on A-77.	A-79 ** A-77, A-78
720th Special Tactics Group (STGP)	The 720th Special Tactics Group (720 STGP) has special operations combat controllers, pararescuemen, and combat weathermen who deploy jointly in teams by air, land, and sea into forward, nonpermissive environments. The unit's missions include air traffic control to establish air assault landing zones, close air support for strike aircraft, personnel recovery, trauma care for injured personnel and tactical meteorological forecasting for Army Special Operations Command. The 720 STGP includes the 23rd Special Tactics Squadron (23 STS) described below. Small arms training, call for fire training, fast rope training, infiltration and exfiltration training are conducted at A-77 and A-78.	A-77, A-78, B-7
23rd Special Tactics Squadron (STS)	The 23 STS flies MH-53 Pave Lows. The squadron comprises pararescuemen, combat controllers, and various support specialties in one cohesive team. This unit provides a force multiplier capability for unconventional warfare in the worldwide arena. The mission of the 23rd STS is to deploy specially organized, trained, and equipped forces to survey and assess assault zones; establish and control landing and drop zones in the most austere and inhospitable regions of the world; set up and operate forward area refueling and rearming point; establish and manage casualty collection, triage and evacuation sites; participate in Air Force Special Operations Command foreign internal defense efforts; and provide special operations terminal attack control capability in hostile environments. Small arms training, call for fire training, and fast rope, infiltration and exfiltration operations are conducted.	A-77, A-78, A-79, B-7

Table 2-1. Test Area User Groups and Associated Military Missions Cont'd

User Group	Training Mission	Test Area
MARINE AIRCRAFT GROUP (MAG) 42	Activities conducted by the MAG 42 include helicopter ordinance training with the use of guns, rockets, and missiles. Munitions used include 20mm, 7.62mm, and .50cal weapons, 2.75 HE (white phosphorus and inert), and the release of flares, chaff, and smoke.	A-77, A-78
38th Rescue Squadron	The 38th RQS is a combat ready pararescue unit and uses various fixed/rotary wing insertion and extraction methods. On site personnel training includes 3 to 12 individuals. Small arms live-fire and gun ship call for fire training are conducted monthly on test sites on A-77. Small arms training, call for fire training, fast rope training, and infiltration and exfiltration activities are part of mission exercises.	A-77
41st Rescue Squadron	The 41st RQS from Moody Air Force Base, Georgia, is a rescue squadron utilizing HH-60 helicopters. The unit specializes in combat rescue of downed aircrews, low-level formation, air refueling, and survivor recovery. Ranges are used for training of various weapons systems, with up to four missions per month. Testing of .50cal and 7.62mm machine guns on HH-60s is conducted.	A-77, A-78

Sources: http://www.spectrumwd.com/c130/usaf2.htm and http://www.globalsecurity.org/military/agency/usaf/20sos.htm

2.3 PROPOSED ACTION

The Proposed Action is for the 46th Test Wing Commander to establish an authorized level of activity within TAs A-77, A-78, A-79, and B-7 based on an anticipated maximum usage (100-percent increase over current baseline level), plus the implementation of Management Requirements, with minimal environmental impacts. The purpose and need for this proposed action is three-fold. The first purpose is to quickly and efficiently process new programs requesting use of the land test areas during routine and crisis situations. The need associated with this purpose is to provide military users a quick response to priority needs during war or other significant military involvement, as well as improve the current approval process for routine uses. The second purpose is to update the NEPA analysis by reevaluating the mission activities and by performing a cumulative environmental analysis of all mission activities. The third purpose arises from the fact that sustainable use of the ranges depends on an improved understanding and compliance with current environmental laws, including the conduct of analysis where it may be lacking. The need is to provide the armed services with suitable arenas in which to test and train in order to maintain proficiency and readiness for situations in which the military is needed.

3. RESOURCE DESCRIPTIONS

3.1 INTRODUCTION

Three species protected under the ESA are potentially found within the vicinity of the TAs, and these species will be considered for impact analyses in Chapter 4. The occurrence of these species is correlated with and affected by the availability of particular habitat characteristics. In general, TAs A-77, A-78, A-79, and B-7 are located in the northwest portion of Eglin AFB in Okaloosa and Santa Rosa Counties, Florida (Figures 1-1 and 1-2; 2-1 through 2-4). TA A-77, A-78, and B-7 are mostly cleared, relatively flat, and lack surface water. Open grasslands/shrublands make up the majority of land cover on these test areas. The cleared areas consist of target areas, roadways, and bunkers established over the grassy plains and vegetation species of broomsedge, switch grass, grasses and herbs, and low-growing shrubs. TA A-79 is primarily wooded property that surrounds Johnson's Pond and a clay pit where training activities take place. The headwaters of Panther Creek are located on A-79, and the creek runs south through the center of the test area. The uncleared portions of all four of the test areas contain forests of longleaf pine, live oaks, and turkey oaks belonging to the Sandhills ecological association. Detailed information regarding the physical resources (e.g. soils, vegetation, hydrology, etc.) can be found in Chapter 3, Affected Environment, of the ATGG PEA.

3.2 SPECIES CONSIDERED UNDER THE ENDANGERED SPECIES ACT

Species described in this section are protected under the ESA and represent the species of concern for impact analyses presented in Chapter 4.

3.2.1 Red-cockaded Woodpecker (*Picoides borealis*)

On Eglin, the Red-cockaded Woodpecker (RCW) typically inhabits mature, open stands of longleaf pine. The RCW does not migrate and maintains year-round territories near nesting and roosting trees (Hooper et al., 1980). Studies by DeLotelle and others (1987) in central Florida found that RCWs foraged primarily in longleaf pine and pond cypress stands with dense ground cover of broomsedge bluestem (*Andropogon virginicus*). The birds will abandon nest cavities when the understory reaches the height of the cavity entrance.

An RCW cluster typically encompasses about 10 acres with most cavity trees most likely within a 1,500-ft-diameter circle. The RCW has shown some preference for mature longleaf pine over other pine species as a cavity tree, with the average age of longleaf pines in which new cavities have been excavated being 95 years. Cavity excavation may take several years and may be utilized by generations of birds for more than 50 years (Jackson et al., 1979).

The woodpeckers primarily feed on spiders, ants, cockroaches, centipedes, and insect eggs and larvae that are excavated from trees. Dead, dying, and lightning-damaged trees that are infested with insects are a preferred feeding source. The birds also feed on the fruits of black cherry (*Prunus serotina*), southern bayberry (*Myrica cerifera*), and black tupelo (*Nyssa sylvatica*) (Baker, 1974).

High-quality RCW forage habitat consists of open pine stands with tree dbh (diameter at breast height) averaging 9 inches and larger. The birds forage in intermediate-aged (30-year-old) and older pine stands, which also provide an important source of future trees for the construction of cavities (U.S. Air Force, 1995). While 100 acres of mature pine is sufficient for some groups, clans commonly forage over several hundred acres where habitat conditions are not ideal (Jackson et al., 1979). The greatest threat to the RCW populations is the loss and fragmentation of their habitat. As a result of active management, RCW populations on Eglin have continued to increase, with the number of active clusters growing from an estimated 217 in 1994 to 321 in 2004 (Moranz and Hardesty, 1998; Hagedorn, 2004).

Eglin's RCW population is considered to be fastest growing large population in the country. The USFWS has identified Eglin AFB in the RCW Recovery Plan as one of 13 designated primary core populations. The USFWS has determined that recovery of Eglin's RCW population will consist of 350 breeding pairs of adult birds. To achieve recovery on Eglin AFB, natural resource managers at Jackson Guard have designated the portion of the Eglin Reservation needed to achieve this recovery goal as the RCW Management Emphasis Area (MEA) (U.S. Air Force, 2002). This "350 MEA" represents the minimal amount of suitable foraging area needed to achieve 350 breeding pairs of RCW in the shortest period of time. In addition to the 350 MEA, the Eglin Commander approved the *Eglin Air Force Base Integrated Natural Resources Management Plan* (U.S. Air Force, 2002) goal of achieving 450 breeding pairs of RCW to maximize mission flexibility. The area needed to achieve this goal is designated as the RCW 450 MEA. TAs A-77, A-78, A-79, and B-7 all fall completely within these designated MEAs. Active and inactive cavity trees are shown in Figure 3-1.

3.2.2 Flatwoods Salamander (*Ambystoma cingulatum*)

The flatwoods salamander, listed as federally threatened, is a small mole salamander about 13 centimeters (cm) (approximately 5 inches) in length when fully mature (Federal Register, 1999). Habitat for the flatwoods salamander consists mainly of open, mesic (moderate moisture) woodland of longleaf/slash pine flatwoods maintained by frequent fires. An open canopy is needed for the grasses and sedges to flourish and must be maintained by periodic burning. The ground cover of this habitat supports a rich herbivorous invertebrate community that serves as a food source for the flatwoods salamander.

Adult flatwoods salamanders breed during the rainy season from October to December (Palis, 1997). Their breeding sites are isolated flatwoods depressions that dry completely on a cyclic basis and are generally shallow and relatively small. No confirmed or potential flatwoods salamander habitat is known to occur on the TAs or within the one-kilometer buffer surrounding these areas.

The isolated nature of flatwoods salamander populations makes them vulnerable to extirpation. The species must maintain moist skin for respiration and osmoregulation (to control the amounts of water and salts in their bodies). Consequently, since they may disperse long distances to upland sites where they live as adults, desiccation (drying out) can be a limiting factor in their movements. As a result, it is important that areas connecting their wetland and terrestrial habitats are protected in order to provide cover and appropriate moisture regimes during their migration.

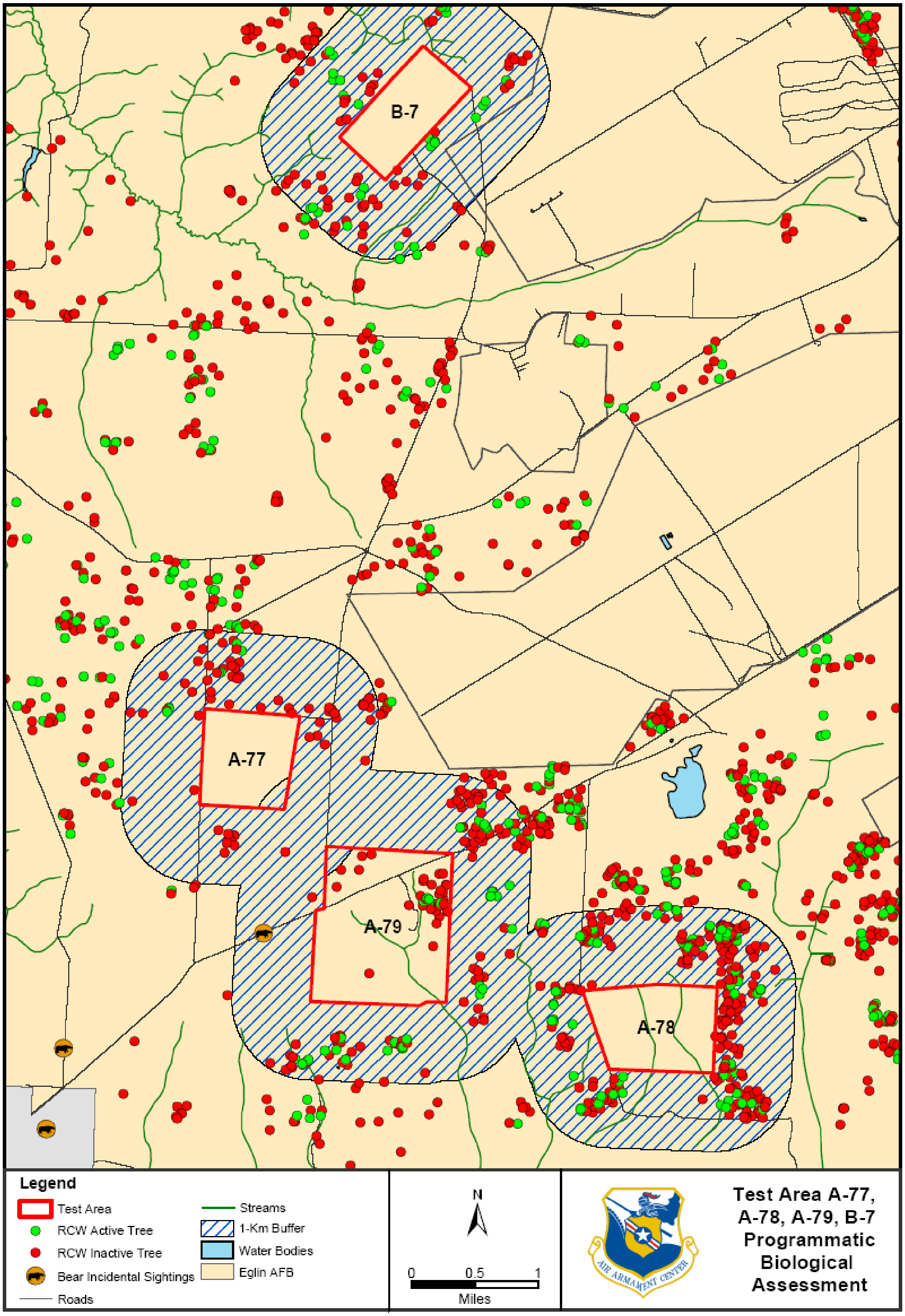

Figure 3-1. Test Areas A-77, A-78, A-79, and B-7 Sensitive Species

3.2.3 Eastern Indigo Snake (Drymarchon corais couperi)

The eastern indigo snake was granted protection by the state of Florida in 1971 and was federally listed as threatened in 1978 (Federal Register Vol. 43, No. 52:11082–11093). The overall range of *Drymarchon corais* extends from the southeastern United States coastal plain to northern Argentina. Only the subspecies eastern indigo (*Drymarchon corais couperi*) and Texas indigo (*Drymarchon corais erebennus*) occur within the United States.

The eastern indigo snake is the largest nonvenomous snake in North America and can grow up to 125 inches in length. The snake is a meat-eater (carnivorous) and will eat any animal up to about the size of a squirrel. The snake frequents flatwoods, hammocks, stream bottoms, canebrakes, riparian thickets, and high ground with deep, well-drained to excessively drained, sandy soils.

Habitat preferences vary seasonally. Pine sandhill winter dens are used from December to April. Summer territories are selected from May to July. From August through November, indigo snakes are frequently located in shady creek bottoms. These seasonal changes in habitat encourage the maintenance of travel corridors that link these different habitat types (Hallam et al., 1998).

The federally threatened eastern indigo snake is strongly associated with gopher tortoise burrows. In Georgia, 92 percent of the indigo snakes identified during the study were located in gopher tortoise burrows (Diemer and Speake, 1983). They use abandoned burrows in winter and spring for egg laying, shedding, and protection from dehydration and temperature extremes. Indigo snakes are even known to use tortoise burrows with collapsed entrances by creating a small entrance. They also use stump holes, armadillo and gopher holes, and other wildlife ground cavities.

The primary reason for its listing as federally threatened is the population decline resulting from habitat loss and fragmentation (Moler, 1987). Movement along travel corridors between seasonal habitats also exposes the snake to danger from increased contact with humans. From 1978 to 1999, Jackson Guard reported the sighting of 18 indigo snakes throughout the Eglin Main Reservation, based on FNAI element occurrences and incidental sightings (U.S. Air Force, 2000). Many of these snakes were seen while crossing roads or after being killed by vehicles.

The AAC/EMSN primarily conducts passive management for the indigo snake by maintaining suitable habitat conditions. This includes the frequent use of fire over large portions of Eglin's sandhills. The closure of forest roads and the use of perimeter access control also benefit indigo snakes by reducing the frequency of accidental motor vehicle and indigo snake contacts.

Additionally, the management and recovery of the eastern indigo snake is closely linked to the gopher tortoise. Management activities that benefit gopher tortoises benefit the indigo snake as well.

4. DETERMINATION OF EFFECTS

4.1 ISSUES

Based on the scope of the Proposed Action, as described in Chapter 2 of this document and in the associated Programmatic Environmental Assessment, potential impacts to ESA-listed species may occur due to noise, habitat alteration, or the introduction of chemical materials into the environment. A description of each of these issues follows.

4.1.1 Noise

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with military training and the conduct of military training exercises. This document considers noise associated with the use of live ordnance at TAs A-77, A-78, A-79, and B-7. Noise from ATGG operations may potentially affect sensitive species that occur on the Eglin Reservation. Several types of noise may be produced during operations such as aircraft noise, ground-based mission noise, and airborne gunnery noise. Aircraft noise is described as a continuous noise, whereas gunnery noise and detonations may be single or repetitive impulse noise events. Different criteria and thresholds are applied to each. Ground-based mission noise is produced by ground operations, which include live small-arms fire, the detonation of explosive munitions or charges, and the impact of gunnery rounds at ground targets. Airborne gunnery noise is produced from the propellant blast of gunnery munitions fired at altitude. The ATGG PEA described and analyzed noise impacts on human populations in detail. The potential noise impacts to ESA-listed species are analyzed in Section 4.2 of this PBA.

4.1.2 Habitat Alteration

A habitat refers to the ecological and geomorphological components, such as vegetation, soil, topography, and water, which support organisms. Habitats may be altered by a variety of factors, including changes in vegetation, structure, food sources, breeding areas, nesting areas, and so on. Habitat alteration may lead to the decreased survival of sensitive species or degradation of areas critical to overall species diversity. Habitat alteration can result from a variety of activities such as the physical strikes of munitions resulting from ATGG activities. However, this type of habitat alteration is not likely to occur because munitions use is focused on target areas contained within the boundaries of the TAs. In this analysis, the predominant cause of habitat alteration would be accidental wildfires resulting from gunnery fire.

Mission activities may impact the physical condition of habitats associated with TAs A-77, A-78, A-79, and B-7. While difficult to quantify, the potential for habitat alteration to occur can be evaluated qualitatively and minimization procedures can be identified that would reduce the potential for adverse impacts. To analyze habitat alteration, authors consulted available literature and maps on wetlands, floodplains, flatwoods salamander habitats, RCW active and inactive cavity trees, and other habitats within the region of influence and communicated directly with parties knowledgeable about resources and potential impacts in the region of influence.

4.1.3 Chemical Materials

The following subsections discuss the effects of the chemical constituents of munitions, chaff, flares, and M-18 grenades on wildlife in general. No specific studies regarding such effects on the ESA-listed species of concern are known. Potential effects on the soils due to unexploded ordnance are discussed in Section 4.7 of the ATGG PEA.

Potential Impacts to Wildlife from Munitions

Metallic components of certain munitions can be toxic to wildlife. Wildlife can be exposed to contaminants through multiple pathways: they may drink or swim in contaminated water, ingest contaminated soil and food, or breathe contaminated air. Animals may move between habitats incurring contamination from several spatially discrete sources. The exposure pathway most likely to occur would be regular ingestion of plants or soil invertebrates growing or living near target areas.

Cattle, sheep, and swine studies identified soil as the main sources of exposure to contaminants, including lead. Soil may be ingested intentionally or incidentally. Wildlife may intentionally feed on soil and grit to supplement mineral deficiencies and/or to assist in food digestion. Seed-eating birds may ingest soil as a digestion aid. Box turtles, tortoises, and other reptiles are known to intentionally consume soil, possibly for its mineral content (Arthur and Alldredge, 1979). Animals can incidentally ingest soil while grooming, digging, grazing, and feeding on soil-covered roots or food sources such as mollusks that contain sediment. Some birds gather mud in their beaks for nest building. Wood ducks can ingest high rates of sediment while feeding (USEPA, 1993). Animals that feed extensively on earthworms may have an increased exposure potential because worms ingest soil directly. Earthworms are typically 20 to 30 percent soil. Estimated soil ingestion rates for several species are presented in Table 4-1.

Table 4-1. Estimated Soil and Sediment in Terrestrial Species Diets

Species	Percent Soil in Diet (dry weight)	Rate of Soil Consumption/Food Consumption (kg/d)
BIRDS		
Wild turkey	9.3	0.0162/0.174
Wood duck	11.0	ND
Shorebirds	10–60	
MAMMALS		
White-tailed deer	<2.0	0.0348
Red fox	2.8	0.0126/0.45
White-footed mouse	<2.0	0.000068/0.0034
Eastern cottontail	6.3	0.015/0.237
REPTILES		
Eastern painted turtle	5.9	ND
Box turtle	4.5	

Sources: USEPA, 1993; Sample and Suter, 1994
ND = no data; kg/d = kilograms per day

Live firing of standard munitions poses a risk of exposure from various metal alloys to certain species of wildlife, particularly those that feed in close contact with the soil and sediments such as some insects, birds, and wild hogs. The adverse environmental impacts of lead in shooting

rounds are well documented. A study by Stansley and others (1997) showed that lead shot accumulates in soil and sediment that surrounds trap and skeet range. Effects in small mammals include elevated blood-lead levels, increased kidney to body weight ratios, and depressed hemoglobin concentrations. Waters impacted from a trap and skeet range were toxic to *Rana palustris* tadpoles.

Effects to frogs include inhibited growth and development (Power et al., 1989), limb malformations, and death (Stansley et al., 1997). If concentrations of spent lead shot are high, aquatic organisms can be easily exposed to toxic shallow surface waters. Waterfowl and birds may also be impacted by training events. Higher levels of lead contamination exist in Spain's Ebro Delta than where lead shot is banned (Mateo et al., 1997). Target areas on test areas A-77, A-78, A-79, and B-7 are located at least 520 feet from the nearest surface water body and dense vegetation surrounds the water bodies on and near these test areas. Given the distance from target areas and the lead absorption potential of the interceding vegetation, no impacts to aquatic species from lead runoff are anticipated.

Birds are particularly vulnerable to lead accumulation because spent shot often lies within the top 3 cm of the soil and many birds feed on organisms in topsoil. Research has shown that lead contamination increases mortality and reduces breeding success. Studies have shown that lead produces anorexia, ataxia, loss of weight, weakness, lethargy, excitement, coma, and quiet death in waterfowl. Egg production, fertility, and hatchability decreases while mortality increases. Lead pollution has even created high levels of mortality in bald eagles and California condors (Pattee and Hennes, 1983; Wiemeyer et al., 1988). Predators of these birds may also be exposed from consuming contaminated carcasses.

Potential Impacts to Wildlife from Chaff

Potential effects on wildlife from the use of chaff are inhalation of chaff fibers, ingestion of chaff fibers, ingestion or contact with the chemical constituents of chaff, and concussion from falling debris. A study conducted by the Air Force (U.S. Air Force, 1995a) showed that chaff dipoles do not break down smaller than PM_{10}, which is the particulate criterion for inhalation. If an animal encounters airborne chaff fibers, they would not be inhaled due to the length of the dipoles, but would be ejected (U.S. Air Force, 1997). As a result, no adverse effects to wildlife are expected from the inhalation of chaff fibers. Studies designed to determine the toxicity associated with direct ingestion of chaff have concluded that chaff presents no health hazards to farm animals nor does it produce toxic effects on aquatic organisms.

Proximity exposure to chaff dipoles may be an irritant when fibers exist in large quantities. This could occur if animals acquire large amounts of chaff fibers in their nesting materials. Proximity exposure was studied by the U.S. Air Force on the Nellis and Townsend Land Ranges, where chaff has been used heavily for many years. Results indicated no evidence of chaff fibers in the nesting materials of birds or rodents that were examined (U.S. Air Force, 1997). Based on the study mentioned above, no detrimental effects from proximity exposure to birds and rodents due to chaff fibers being used as nesting material are expected.

Toxicity thresholds are those levels at which exposure to chemicals or elements would cause detrimental effects to biological systems. Toxicity thresholds in soils, surface water, ground

water, and sediments can be determined either by estimating the hazards from exposure to those media or by reference to an agency's standards. Target concentration limits are hazard-based concentration limits for soil: the National Ambient Water Quality Criteria (NAWQC) for surface water and the Maximum Concentration Level (MCL) for ground water (U.S. Air Force, 1997b). The Toxicity Reference Value (TRV) is used as a reference value for toxicity levels for biological systems. It is calculated by using allometric (growth) correction factors for size and metabolic rate of the receptor (Opresko et al., 1995). Toxicity of aluminum varies among receptors, but is generally typical of metal ions. Aluminum (Al^{+3}) toxicity results from the uptake of Al^{+3}, meaning that toxic exposures would only occur in conditions resulting from the production of soluble Al^{+3}. The secondary MCL for aluminum in ground water is 0.2 mg/L. The chronic NAWQC for Al^{+3} is 87 mg/L. Table 4-2 summarizes toxicity thresholds for various receptors.

Table 4-2. Toxic Effects and Concentrations of Aluminum

Receptor	Toxic Effects	TRV	Reference
Plants	Decreases respiration and uptake of essential nutrients, interferes with cell division.	50 mg/kg soil	Will and Suter, 1995
Earthworms	No toxicity data available for aluminum.	No toxicity data available for aluminum.	Will and Suter, 1995
Small mammals (e.g., short-tailed shrew)	Dermal contact with aluminum and aluminum oxide (Al_2O_3) powder may cause skin necrosis; inhalation may cause pneumoconiosis. In toxicity studies, chronic dietary ingestion caused decreased growth of mouse offspring.	LOAEL = 23 mg/kg/day	Opresko et al., 1995
Birds (e.g., American Robin)	Chronic dietary intake caused decreased reproduction by chickens.	LOAEL = 44.5	Opresko et al., 1995

LOAEL = Lowest observed adverse effects level
mg/kg = Milligrams per Kilogram mg/kg/day = Milligrams per Kilogram per Day
TRV = Toxicity reference value, calculated by using allometric correction factors for size and metabolic rate of the receptor
Source: U. S. Air Force, 1997a

Ingestion of chaff fibers may occur inadvertently due to the mixing of the dipoles with vegetative matter, soil, or other feeding matter (U.S. Air Force, 1997a). Aluminum materials deposited in soils may be contacted directly or be ingested by those animals that ingest soil as they feed. Animals may also ingest aluminum materials by eating plants that have taken it up through their roots. Therefore, the potential exists for bioaccumulation of aluminum materials through the food chain as animals eat plants or other animals that have acquired aluminum materials. Potential receptors are earthworms; small herbivorous, insectivorous, and omnivorous mammals; and birds that feed on insects and earthworms (U.S. Air Force, 1999). Because earthworms consume large amounts of soil, animals such as birds and small mammals that consume large quantities of earthworms are the most at risk for exposure, and therefore tolerate the lowest concentrations of available aluminum in soil. Raptors and other predators may be exposed through consumption of animals that have bioconcentrated contaminants.

A number of studies have been conducted on the effect of chaff ingestion by farm animals. Because the animals avoided the ingestion of chaff by itself, the studies mixed chaff with feed materials that were then ingested by cattle and goats. No differences in weight or development were observed, and no abnormalities in the digestive tract were found postmortem (U.S. Air Force, 1997c). The study using goats is particularly relevant because goats are similar to deer in browsing habitats and physiology. These studies concluded that ingestion of chaff did

not present a hazard to farm animals. Ingestion of chaff is not likely to occur because concentrations at ground level are quite low, and chaff is chemically nontoxic (U.S. Air Force, 1999).

Potential Impacts to Wildlife from Flares

Mechanisms of toxicity vary among ecological receptors and depend on availability. Toxicity reference values (TRVs) are derived from the experimental No Observable Adverse Effects Level (NOAEL) and Lowest Observable Adverse Effects Level (LOAEL). While a review of the literature revealed no threshold levels for magnesium regarding plants and wildlife, tests have been conducted on plants, mice, and fish in order to determine the effects of flare residue on biological systems. The residue was mostly Magnesium Oxide (MgO) and was approximately 50 percent total magnesium. Mice exposed to flare residue in their drinking water (2,500 mg/L) and by direct contact showed no signs of toxic effects.

Potential effects on wildlife from the use of flares are inhalation of flare ash and ingestion of or contact with the chemical constituents of flares. Because concentrations of airborne flare ash would be minimal, with particles being widely dispersed due to wind and other environmental factors before reaching ground level, there is no potential for adverse effects related to the inhalation of flare ash to wildlife.

The toxic effects of flare ash residue were tested on mammals, plants, and fish with concentrations of flare ash representing the high range that would be found in a pyrotechnic test area. Results indicated that the effects of flare ash residue are very minimal and not particularly dangerous to the environment (U.S. Air Force, 1997). The resultant addition of chemical constituents to soils is not of sufficient quantities to raise background levels substantially. For this reason, it is assumed that there would be no potentially adverse effects from the inadvertent digestion of flare ash or its chemical constituents. Animals in direct contact with large quantities of flare ash could experience skin irritation.

Resultant concentrations of flare ash and residue added to the environment from the use of flares over the ATGG test areas should pose no threat to sensitive species. The resultant addition of chemical constituents of flares is not of sufficient quantities to change soil, water, or air chemistry. None of the threatened or endangered species are known to be especially sensitive to the chemical constituents of flares. As a result, sensitive species should not be adversely affected from the use of flares

Potential Impacts to Wildlife from M-18 Grenades

Wildlife would be potentially exposed to dye-colored smoke through inhalation, ingestion, direct contact, and bioconcentration. The most likely opportunity for such exposure would be immediately after the smoke has been dispelled, but since wildlife would most likely leave the area during training exercises, direct exposure to toxic levels of emissions is not anticipated. Once released, smoke grenade dyes could persist in the environment for a time, eventually settling out on water or land. Ingestion or inhalation of particles in sufficient amounts to cause harm is unlikely due to the wind driven distribution of smoke particles. However, since dye compounds do persist in the environment, bioconcentration of dye particles in the tissues of animals is a possibility.

Guidelines established by the USFWS that indicate that the use of smokes and flares within 200 feet of RCW cavity trees would not adversely affect this species (U.S. Army, 1996; USFWS, 1996). Impacts to RCWs and other wildlife on the test areas are not anticipated from smokes.

4.2 POTENTIAL EFFECTS OF ISSUES ON ESA-LISTED SPECIES

The issues identified in Section 4.1 are evaluated here for potential impacts upon the ESA-listed species described in Section 3.5.

4.2.1 Red-cockaded Woodpecker

4.2.1.1 Noise

Potential for Noise Injury to Red-cockaded Woodpeckers from Munitions

The maximum safe noise exposure level for humans without ear protection is 140 decibels (dB) of unweighted peak sound pressure level (dBP), a threshold that is based on exposure to a hundred 140-dBP noise events over a 24-hour period (U.S. Air Force, 1996). This conservative but reasonable threshold is used for estimating potential noise impacts to RCWs in the absence of any specific threshold for the species.

Noise from bombs and artillery was modeled using the Noise Assessment and Prediction System model developed by Dr. Jim Luers of the Dayton Research Institute (Dayton Research Institute, 1990). The model estimates the peak noise intensity, expressed as pressure decibels or dBP, at ground level in all directions surrounding a blast source. The TNT-equivalent net explosive weight (NEW) and desired weather conditions are input into the model, and noise in decibels by distance from the noise source are generated in the output. A favorable (meaning not conducive to propagating noise) weather scenario of no winds and no temperature inversions was input into the model for an Mk-82, 40-lb C-4 charge, 25-lb rocket, and 7-lb gunnery ordnance. These munitions were selected for analysis because they have the potential to affect the largest area in terms of noise impacts of all munitions currently used on the respective TAs. Winds and inversions have little effect on noise greater than 140 dBP. Therefore, other scenarios were not considered.

Noise analyses were conducted for TAs A-77 and A-78 where 25-lb rockets, the largest ordnance used in these areas, have historically been deployed during ATGG testing. Because information was not available on which target areas on A-77 and A-78 were used for the rockets, for conservative analysis, it was assumed that the rockets were dropped on the target areas closest to active RCW trees in order to show maximum potential impacts (Figure 4-1). Table 4-3 provides information on the impact area as well as the number of active RCW cavity trees impacted at A-77 and A-78. At the conservative 140-dBP level, 22 active RCW trees on A-77 and A-78 would be impacted by this detonation. However, at the 154-dBP level, no RCWs would be impacted.

Table 4-3. Noise Impact Zones of 25-lb Rocket at Test Areas A-77 and A-78

	154 dBP	140 dBP
Impact Radius (feet)	498	1243
Impact Area (acres)	18	134
Number of Active RCW Trees Impacted A-77 TT-1	0	3
Number of Active RCW Trees Impacted on A-78 at TT-12	0	19

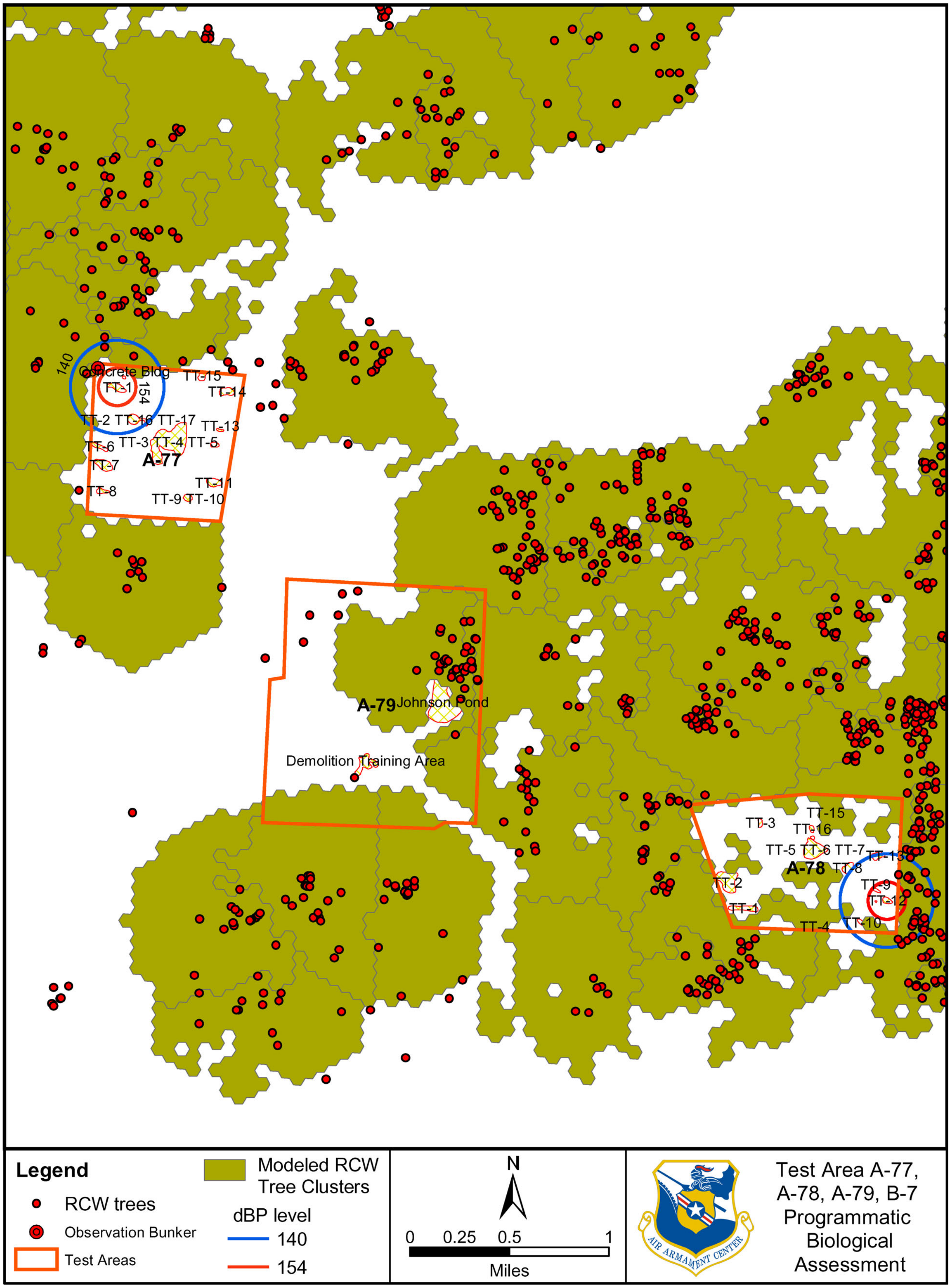

Figure 4-1. Test Areas A-77 and A-78 Potential Noise Impacts to Protected Species

During the four years of data captured between 1998 and 2001, this ordnance was only used in 1999. Rockets were fired only twice on A-77 and only six times on A-78 in 1999. Therefore, the frequency of impacts of noise from this large detonation is minimal. The 25-lb rocket was chosen for analysis because it is the most powerful explosive used on these test areas and thus shows the maximum potential for impacts to RCWs. Also, use of the target areas closest to RCW trees provides an artificially high number of impacted trees because the rockets likely are not actually targeted that close to the trees, and in fact could be a sufficient distance away such that they would not impact any RCW trees.

Analysis of RCW locations at TA A-79 reveals that noise impacts from Mk-82 detonations would be minimal. In the past, detonations in Johnson's Pond created noise impacts that had the potential to injure RCWs at the 140-dB and 154-dB levels. Table 4-4 and Figure 4-2 present information for the area of impact and the number of active RCW cavity trees affected by the detonation of an Mk-82.

Table 4-4. Noise Impact Zones of Mk-82 at Johnson's Pond, Test Area A-79

	154 dBP	**140 dBP**
Impact radius (feet)	750	2490
Impact area (acres)	40	450
Number of active RCW trees	4	6

Six active RCW trees would be exposed to 140 dBP, while four active RCW trees would be exposed to noise at the 154-dBP level. Although four Mk-82s were dropped in 1998, the Air Force has ceased using TA A-79 for this purpose. Therefore, no impacts from this heavy ordnance are anticipated. If use of the Mk-82 in Johnson's Pond were reinitiated, consultation with the USFWS would be needed to abate the potential for injury to RCWs on the test range. The number of impacts would likely be similar to those shown in Table 4-4, because those impact calculations are based on detonations occurring at the pond's surface.

From the same model for noise as used for the analysis of Mk-82 detonations, the impact area for the largest ordnance used in the clay pit on A-79, the 40-lb C-4 charge, was estimated. Table 4-5 provides information on the area of impact, as well as the number of RCW cavity trees impacted.

Table 4-5. Noise Impact Zones of 40-lb C-4 Charge at the Clay Pit, Test Area A-79

	154 dBP	**140 dBP**
Impact radius (feet)	500	1495
Impact area (acres)	18	161
Number of active RCW trees	0	0

During training exercises in the clay pit, noise exposure would potentially occur to some forage areas as well as one inactive cavity tree on A-79, but no active RCW trees would be impacted by this detonation at either the 154-dBP or 140-dBP level. Finally, analyses were conducted for 7-lb gunnery charges on TA B-7. This ordnance has the highest NEW for any of the munitions used on this site. A total of 1,133 7-lb gunnery charges have been expended on this range since 1998. An annual average of 283 rounds were expended during a four-year period. The maximum discharge of 518 expended rounds occurred in 2000. Table 4-6 provides information on the impact area and active RCW trees impacted by the largest ordnance employed during ATGG exercises on TA B-7.

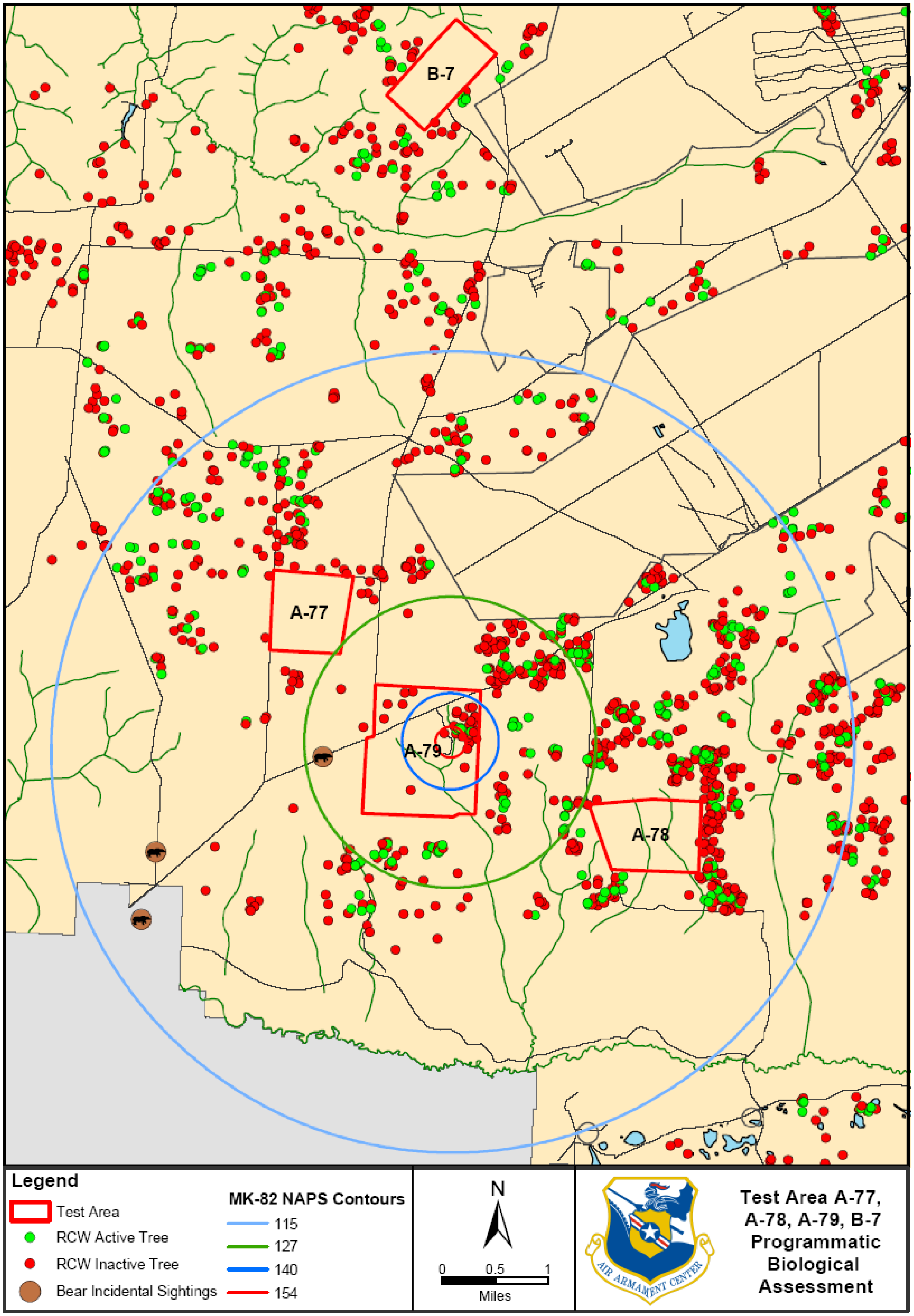

Figure 4-2. Test Area A-79 Potential Noise Effects to Protected Species

For conservative analysis, it was assumed that the target area closest to active RCW trees was used for all of the 7-lb gunnery activity in order to show maximum potential for impacts to RCWs.

Table 4-6. Noise Impact Zones of 7-lb Gunnery on Test Area B-7

	154 dBP	140 dBP
Impact Radius (feet)	252	998
Impact Area (acres)	9	107
Number of Active RCW Trees	0	5

At the 140-dBP level, five red-cockaded woodpecker cavity trees would be exposed to potentially injurious noise. Use of the 7-lb gunnery on B-7 is frequent, and the noise it produces is repetitious. Continuous noise at levels around 140 dBP injures human ears, and assuming that it would cause similar injury to RCWs, impacts from the use of this ammunition would be of more concern than the infrequent rocket use on Test Areas A-77 and A-78. Analysis assumed that the target area closest to active RCW trees was used for all 7-lb gunnery activities. However, in reality, it may be used a safe distance from the RCW trees. Therefore, noise impacts to RCWs may be less than that modeled.

Across Eglin, no difference in group size or behavior of RCWs has been observed in areas near test areas versus areas without gunnery operations (Hagedorn, 2003). RCWs probably have become habituated to the noise of munitions within the four test sites and continue to nest successfully in close proximity to the test areas (Hagedorn, 2003). Suitable habitat appears to outweigh any negative influences associated with noise. Studies at a Navy bombing range in Mississippi have indicated that RCWs can acclimate to excessive noise levels (Jackson, 1980). Observations have indicated that many animals become adapted to human activities and noises (Busnel, 1978). Scientists who have researched the effects of noise on wildlife report that animals will react with a startle effect from noises, but adapt over time, so that even the startle behavior is eradicated (Busnel, 1978). Based on the fact that the RCW population continues to grow at Eglin, it appears that they have adapted to much of the noise associated with military missions. However, it may be necessary to consult with the USFWS for noise impacts to RCWs depending on the actual locations where munitions are being used on the TAs.

An increase in ATGG testing, as proposed in the Preferred Alternative of the ATGG PEA, would increase the amount of expended ordnance, thereby increasing the frequency for potential noise impacts by an unknown probability. However, the area of impact would remain the same under this scenario. An increase in the frequency of activities would not be expected to appreciably increase the likelihood of impact to RCWs. However, monitoring of these populations should be continued in order to detect possible changes in the population that may be related to the increase in ATGG activities. **Noise associated with munitions use during ATGG operations is NOT LIKELY TO ADVERSELY AFFECT red-cockaded woodpecker individuals or populations. Adherence to the Management Requirements identified in Chapter 5 would minimize the potential for adverse impacts.**

Potential Noise Impacts to Red-cockaded Woodpeckers from Ground Movement

Vehicle and troop movement could potentially create noise and disturbance that could affect RCWs. However, due to unexploded ordnance contamination, ground movement is minimal on all of the test areas. No active cavity trees occur on TAs A-77, A-78, and B-7, but there are some active cavity trees on A-79. Currently, the only ground activity on A-79 is demolition training in the clay pit discussed under Table 2-1. The range of influence for noise impacts from the C-4 detonations far outweigh the range of noise impacts from ground activity in the clay pit; thus, since no RCWs were found to be impacted by noise from the C-4 detonations, no impacts are anticipated to RCWs from noise associated with ground activities on A-79. During HAVE ACE activities, as described in Table 2-1, small numbers of troops (6 to 10 individuals) may engage in stealth movements from Auxiliary Field 6 south toward TAs A-77 and A-78, or west along the Yellow River before moving to TA A-77. Adherence to the U.S. Army Guidelines for the conservation of RCWs, and the corresponding USFWS Biological Opinion, would minimize potential noise impacts resulting from such ground movement. An important aspect of the Biological Opinion is the recognition of a 200-foot buffer zone around individual RCW cavity trees where certain activities are prohibited, such as bivouacking, establishing command posts, and excavating. Transient foot traffic through the buffer zones and transient vehicle traffic that stays on existing roads would be allowed. These guidelines are discussed further in Section 5.1. **Therefore, noise associated with ground movement during ATGG operations is NOT LIKELY TO ADVERSELY AFFECT red-cockaded woodpecker individuals or populations.**

Potential Noise Impacts to Red-cockaded Woodpeckers from Aircraft

Responses by birds to aircraft-induced noise varies by species. The impacts range from no disturbance to changes in reproductive and breeding success. In a recent study, Delaney et al., (2000) found that RCWs did not leave their cavity trees when helicopters were greater than 100 meters from their nest. Additionally, flushes from nesting trees decreased with increasing distances between birds and overhead aircraft. Helicopter engines make a continuous noise, with impulses sometimes arising from pulsating rotor blades. Research has shown that continuous noises are less likely to induce a response by wildlife than short blasts. In fact it has been shown that military blast noise poses a greater threat than this type of continuous noise. Additionally, the aircraft used in ATGG missions, the AC 130H, would not fly below 915 meters, and thus would not induce flushing of RCWs from cavity trees. **Therefore, noise associated with aircraft during ATGG operations is NOT LIKELY TO ADVERSELY AFFECT red-cockaded woodpecker individuals or populations.**

4.2.1.2 Habitat Alteration

With 321 active clusters, Eglin AFB is home to the fourth largest population of RCWs. As such, Eglin AFB is considered to be crucial for the downlisting and recovery of this species. RCWs excavate roost and nest cavities through the living sapwood of southern pine trees. The RCW prefers longleaf pines more than 85 years old due to their susceptibility to red heart disease, which softens the wood and makes it less difficult to excavate. Because cavity excavation requires a substantial investment of time and energy, it is extremely important to protect these cavity trees.

On Eglin, RCWs occupy open park-like stands of longleaf pine sandhills and flatwoods. These habitats require frequent prescribed fire to maintain their grassy understory and to prevent midstory encroachment. In the absence of frequent fire, hardwoods quickly encroach into the midstory of longleaf pine ecosystems, allowing predators access to cavity trees. For the RCW, fire maintains the native groundcover that supports the insects and other arthropods upon which RCWs feed. While prescribed fire is critical for the management of the RCW, wildfires under dry or windy conditions may cause substantial mortality to RCW cavity trees.

In advance of prescribed fires on Eglin AFB, RCW cavity trees are individually prepared to prevent potential damage. This pre-burn preparation includes mowing vegetation under the tree with a Brown tree cutter out to a distance of 25 feet. Resulting clippings and debris are then raked from the area. If sap from the cavity runs down the tree to within 6 feet of the ground, then the bark is gently scraped to remove that sap, which could otherwise spread fire from the ground up the tree.

An applied research project on Eglin AFB in 2001 studied the effects of cavity tree preparation in advance of burning (U.S. Air Force, 2003). In total, 814 trees were monitored, including both active and inactive cavities. Cavity tree mortality was three times higher in unprepared trees versus prepared trees (Figure 4-3). This study demonstrates that cavity trees are vulnerable to fire, particularly in the absence of any pre-burn treatments. The study suggests that historic fire suppression, high-grading of old-growth longleaf pine, and the damage caused by cavity excavation by the RCW predispose these trees to mortality (U.S. Air Force, 2003).

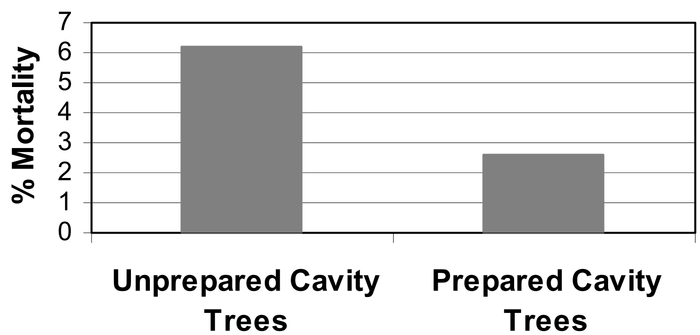

Figure 4-3. Percent Mortality in Prepared Versus Unprepared RCW Cavity Trees
(U.S. Air Force, 2003)

RCWs are found near or on test areas A-77, A-78, A-79, and B-7 (shown previously in Figure 3-1). Military operations have the potential to impact RCW cavity trees near the ranges via catastrophic wildfires that escape the ranges following ignition by exploding ordnance. Through live ammunition activities and the use of incendiary devices, wildfires are frequent occurrences. Missions on these TAs have been responsible for starting 54 wildfires in a five-year period from 1998–2002 (U.S. Air Force, 2003a). These areas have the highest density of wildfires on the Eglin Reservation. The fires can be either beneficial or harmful to natural communities, depending on the fire severity and efficacy of suppression activities. Although fire is a necessary element to maintaining RCW habitat and the longleaf pine ecosystem, under certain conditions, fires may cause unusually high levels of mortality in canopy trees, particularly RCW cavity trees.

Wildfire suppression activities are restricted around these ranges due to unexploded ordnance concerns, particularly unspent 105mm rounds jettisoned from C-130 gunships circling around the ranges. Traditional direct fire suppression methods, such as plowing firebreaks, are not an option on and around these TAs. Thus, wildfires in these areas may be very difficult to control. Typically, wildland fire fighting in these areas is confined to block and burn techniques, where suppression teams must hold wildfires by setting counterfires on the network of roads surrounding the ranges. This restriction significantly increases the likelihood that, under adverse conditions, wildfires escaping from these ranges will grow large in size and impact numerous active RCW cavity trees. Ten such large fires (>900 acres) have occurred over the past five years (U.S. Air Force, 2003a).

Wildfires do not allow for the prepping of RCW cavity trees. Wildfires of sufficient severity have the potential to kill significant numbers of RCW cavity trees under adverse conditions. Given that mortality rates for unprepared cavity trees under normal burning conditions may exceed six percent (U.S. Air Force, 2003), wildfires under adverse conditions could be catastrophic. Currently, there is no database that documents all cases of cavity tree mortality resulting from wildfires started on TAs A-77, A-78, A-79, or B-7. However, mortality data were collected over the five-year period from 1998 to 2002. During this time, which included two unusually intense fire seasons, a total of 189 active and 681 inactive cavity trees were within areas burned (but not necessarily damaged) by wildfires started by Air Force missions on these test areas (U.S. Air Force, 2003b). A total of 119 of these cavity trees (41 active and 78 inactive) died during that time from various causes, including fire. Approximately 17 percent of this mortality is known to have been caused by fire, with another 38 percent resulting from unknown causes. Assessments of delayed mortality in longleaf pine suggest that much of the mortality attributed to unknown causes may be the result of fire. Therefore, up to 55 percent of the mortality could have been caused by fire.

Currently, there are 137 active and 492 inactive RCW cavity trees within the consultation area, which includes the TAs plus a one-kilometer buffer around each TA. In the absence of additional information, it is reasonable to apply the percentages determined for the 1998–2002 period to the current condition. Table 4-7 summarizes the five-year data as well as estimates of future mortality. The total number of cavity trees is different in the two data sets because alternate counting methods were used. The 1998–2002 data includes all trees within all burn areas of fires originating on the TAs over a five-year period. The current data includes all trees within the consultation area, as defined previously.

Table 4-7. Summary of RCW Cavity Tree Mortality Due to Fire

1998 – 2002 Summary Data			
	Active	**Inactive**	**Total**
Total Number of Cavity Trees	189	681	870
Total Mortality	41	78	119
Total Mortality Due To Fire	23	43	66
Mortality Due To Fire Per Year	5	9	14
% Cavity Tree Mortality Due To Fire Per Year	2.6%	1.3%	1.6%
Current Data			
Total Number Of Cavity Trees	137	492	629
Potential Mortality Due To Fire Per Year	4	6	10

The research effort summarized in Figure 4-3 suggests that the preparation of cavity trees can reduce mortality by a factor of more than two. The management requirements identified in Chapter 5 include maintaining a two-year prescribed burn interval around the TAs, which would provide for the systematic preparation of cavity trees. This, along with the other specified requirements, would likely reduce the mortality estimated in Table 4-7. It should also be noted that the percentage of cavity trees potentially killed by fire was extrapolated from the 1998–2002 data, which included two unusually intense fire seasons.

A 100-percent increase in ATGG activity, as described in the Preferred Alternative of the ATGG PEA, would not likely increase the area of habitat directly impacted by munitions, but there would potentially be an increase in indirect impacts to sensitive habitat through an increase in the number of wildfires. Although wildfires can have both negative and positive impacts, it is preferable to minimize them. An increase in wildfires would potentially lead to an increase in RCW cavity tree mortality and old-growth longleaf pine mortality. However, the potential mortality increase will be mitigated by the management requirements described in Section 5.2. **Therefore, wildfires associated with ATGG operations are NOT LIKELY TO ADVERSELY AFFECT red-cockaded woodpecker individuals and habitat. Adherence to the Management Requirements identified in Chapter 5 would help to minimize the potential for impacts.**

4.2.1.3 Chemical Materials

Potential impacts to wildlife resulting from the deposition of chemical materials, as discussed in Section 4.1.3, may occur through the use of munitions, chaff, flares, and M-18 grenades. The effects of expending flares and M-18 grenades were analyzed and determined to pose little risk to RCWs or other wildlife. The expenditure of munitions and chaff, however, could potentially impact RCWs via ingestion of the toxic metallic compounds released into the soil by these objects. Aluminum materials may be deposited into the soil from chaff, and lead and several other metal alloys may be deposited through spent munitions. These materials may then be ingested by invertebrates. Although RCWs do not forage on the ground, preying instead upon insects found on various pine and hardwood trees, some of the prey may spend time in or on the soil before being consumed by the birds. For instance, the RCW Recovery Plan states that a large number of arthropod prey arrives at a tree by crawling up from the ground. Therefore, any bioaccumulation of metals in these invertebrates may be transmitted to the RCW.

Despite these possibilities, the likelihood of chemical materials presenting a threat to RCWs is considered low. The rate of metal degradation is relatively slow in the soils found in the TAs associated with this PBA. Metal casing corrosion is expected to be limited and non-impactive to soils. The bioaccumulation of toxic metals in RCWs due to ingestion of invertebrates is considered unlikely. **Therefore, the deposition of chemical materials associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT red-cockaded woodpecker individuals or populations.**

4.2.2 Flatwoods Salamander

4.2.2.1 Noise

No confirmed or potential flatwoods salamander habitat is known to occur on any of the TAs or within the one-kilometer buffer surrounding these areas. In addition, the salamanders spend a large majority of time underground, where aboveground noise would be attenuated. **Therefore, noise associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT flatwoods salamander individuals or populations.**

4.2.2.2 Habitat Alteration

No confirmed or potential flatwoods salamander habitat is known to occur on any of the TAs or within the one-kilometer buffer surrounding these areas. Wildfires resulting from ATGG operations could potentially affect potential flatwoods salamander habitat, but it would most likely benefit the area by eliminating the St. John's wort that can take over flatwoods salamander ponds in the absence of fire (Palis, 1997). However, prescribed burning under more controlled and monitored conditions is preferred by Eglin Natural Resources (AAC/EMSN) for habitat maintenance. The suppression activities that are used in some areas to control wildfires (e.g., plowlines) would not be of concern around these test areas because of unexploded ordnance contamination. **Therefore, habitat alteration associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT flatwoods salamander individuals or populations.**

4.2.2.3 Chemical Materials

The expenditure of chaff and munitions may lead to the introduction of harmful metals into the soil, as discussed in Section 4.2.1.3. These materials may be ingested by invertebrates, which may in turn be preyed upon by salamanders. Flatwoods salamanders spend a considerable amount of time underground, and feed primarily on soft-bodied invertebrates such as worms, beetles, and larvae. In addition, salamanders possess permeable skin and may therefore absorb harmful materials directly. However, the rate of metal degradation in the soils of the TAs is low, and metal casing corrosion is expected to be limited and non-impactive to soils. The risk of bioaccumulation of toxic metals in flatwoods salamanders due to ingestion of invertebrates is considered low. **Therefore, the deposition of chemical materials associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT flatwoods salamander individuals or populations.**

4.2.3 Eastern Indigo Snake

4.2.3.1 Noise

The eastern indigo snake is strongly associated with underground gopher tortoise burrows. No burrows have been documented within the boundaries of any of the TAs. This is an active species, however, and may occasionally move through a TA in search of food or a mate. Although snakes lack external ears, they are generally capable of conducting sounds via mechanoreceptors in the skin and possibly other parts of the body. Sound detection appears to be more sensitive in the lower frequencies. The behavioral response of eastern indigo snakes to gunnery-type noises is unknown. However, the intermittent occurrence of both the snakes on the

TAs and the gunnery missions suggests that impacts would be minimal. Direct physical impacts (trampling or crushing) are considered to be a much more viable threat to this snake than noise. **Therefore, noise associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT eastern indigo snake individuals or populations.**

4.2.3.2 Habitat Alteration

Potential eastern indigo snake habitat could be affected by wildfires started on the TAs. However, wildfires would most likely result in a benefit to such habitat. The AAC/EMSN's management techniques for the eastern indigo snake include frequent use of fires over large portions of Eglin's sandhills in order to maintain suitable habitat conditions. **Therefore, habitat alteration associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT eastern indigo snake individuals or populations.**

4.2.3.3 Chemical Materials

The expenditure of chaff and munitions may lead to the introduction of harmful metals into the soil, as discussed in Section 4.2.1.3. The potential exists for the bioaccumulation of these metals in the eastern indigo snake by means of the food chain. Eastern indigo snakes prey upon a variety of small animals including other snakes, frogs, small mammals, birds, and fish. These prey items could possibly contain metals because of their ingestion of soils invertebrates or because of the degradation of water quality due to ATGG activities. However, the rate of metal degradation in the soils of the TAs is low, and metal casing corrosion is expected to be limited and non-impactive to soils. Potential impacts to water quality were analyzed in the ATGG PEA and were determined to be not significant. **Therefore, the deposition of chemical materials associated with ATGG operations is NOT LIKELY TO ADVERSELY AFFECT eastern indigo snake individuals or populations.**

5. MANAGEMENT REQUIREMENTS

The ATGG PEA described a number of proposed range sustainability Management Requirements, which are designed to reduce impacts to sensitive habitats and protected species associated with the TAs. Management Requirements that may decrease the impacts to ESA-listed species fall under the categories of noise, habitat alteration, and chemical materials, as discussed in the following sections.

5.1 NOISE

Employment of Management Requirements could help reduce noise impacts to sensitive species. Use of targets should be shifted to internally established targets that are away from active RCW cavity trees. This action would reduce the potential for impacts to RCWs. It has been found that haphazardly timed and variable noise creates higher levels of disturbance to wildlife. Therefore, firing and overflight activities should occur at regular intervals, when possible.

U.S. Army Guidelines, along with the corresponding USFWS Biological Opinion, would minimize potential noise and disturbance from ground movement activities (U.S. Army, 1996; USFWS, 1996). An important aspect of the Biological Opinion is the recognition of a 200-ft buffer zone around individual RCW cavity trees and the concurrence regarding the types of activities allowed within the 200-ft buffer that would not result in impacts to RCWs. The USFWS agreed with the U.S. Army that transient foot traffic within 200 feet of RCW cavity trees would have no effect on RCWs, nor would transient vehicle traffic that stayed on existing roads (U.S. Army, 1996; USFWS, 1996). Transient activities are defined as those that involve maneuver-type training, have low-intensity human activity, and a short-term (less than two-hour) human presence (U.S. Army, 1996). Activities that are not allowed within the 200-ft buffer zone include bivouacking and establishing command posts and excavating/digging.

The proponent may be required to mark 200-ft buffer zones around active RCW cavity trees potentially impacted by ground movements. Additionally, military activities that are within or near stands of mature long-leaf pine and scheduled during red-cockaded woodpecker nesting season (late April–July) should be coordinated with the Natural Resources Branch. Monitoring of RCWs should also continue.

5.2 HABITAT ALTERATION

The largest potential agent for habitat alteration on and around TAs A-77, A-78, A-79, and B-7 is wildfire. Management Requirements that would minimize the potential for catastrophic wildfires near these test areas include the following.

- Follow Eglin Wildfire Specific Action Guide Restrictions for pyrotechnics use by class day; specifically, do not conduct hot missions under class D or E levels as determined by the Wildland Fire Management Program at Jackson Guard.

- Through Jackson Guard, have sufficient resources (i.e., fire management personnel and equipment) available to respond to fire emergencies.
- Maintain graded road grid around gunship ranges to facilitate suppression in the event of a wildfire ignition.
- Use Eglin's burn prioritization model to increase the prioritization of prescribed fire at the Test Areas, so that an approximately two-year burn interval is maintained around all these ranges to reduce hazardous fuel accumulations.
- Per the Eglin Wildfire Specific Action Guide, establish post-mission fire watch of 20 to 30 minutes to search for smoke/fire from mission activities, unless otherwise directed by Jackson Guard.
- Immediately notify Eglin Fire Department Dispatch of any wildfire started as a result of gunnery missions.

Management Requirements Specific to Red-cockaded Woodpecker Habitat

Wildfire impact to RCW cavity trees is the biggest threat to RCW recovery in the areas surrounding TAs A-77, A-78, A-79, and B-7. In addition to the fire Management Requirements listed above, implementation of these Management Requirements would be expected to minimize RCW cavity tree mortality.

- Prep RCW cavity trees before prescribed burns.
- When monitoring RCW cavity trees adjacent to these ranges, record cause of mortality.
- Replace any cavity tree damaged by fire to the point that it is unsuitable for nesting or roosting with an artificial cavity within 72 hours of the damage according to the *Eglin Air Force Base Integrated Natural Resources Management Plan Biological Opinion* from the USFWS (U.S. Air Force, 2002a). This will be accomplished by one or a combination of 1) retaining a contractor to install the artificial inserts, 2) partnering with the Gulf Coast Plain Ecosystem Partnership to install the artificial inserts, and 3) training Eglin Natural Resources Branch personnel to install the artificial inserts.

An Eglin study looking at RCW cavity tree mortality found that mortality was nearly three times as high in unprepared trees versus prepared trees, so the Management Requirements above focus on prescribed burning and preparing cavity trees, which would decrease mortality. Implementation of the general fire Management Requirements would decrease catastrophic wildfires on and around TAs A-77, A-78, A-79, and B-7, benefiting RCWs by decreasing the potential for hot fires that kill cavity trees. These Management Requirements are anticipated to decrease impacts to RCW cavity trees from wildfires.

Management Requirements Specific to Flatwoods Salamander Habitat

The introduction of fire Management Requirements would likely decrease the frequency of wildfires and increase the frequency of prescribed fire. For flatwoods salamander habitat around these TAs, the most important thing is that fire is introduced frequently, whether it is wildfire or prescribed fire. However, prescribed burning under more controlled and monitored conditions is

preferred by AAC/EMSN for habitat maintenance. Implementation of fire Management Requirements would reduce potential impacts to flatwoods salamander habitat.

5.3 CHEMICAL MATERIALS

Munitions Management Requirements that would reduce the impact from chemical materials on wildlife include:

- Employment of frangible munitions, when possible.
- Employment of non-lead munitions, when possible.
- Recovery of munition casings from streams, wetland areas, and interior objectives, when possible.
- Recovery of approximately 60 percent of the brass casings expended during ATGG training.
- Avoidance of deposition of casings and other materials into sensitive species' habitats.

There are three types of ammunition analyzed in this section: lead projectile munitions, frangible munitions, and "green" munitions with non-lead projectiles. Frangible munitions are of non-lead composition and of limited range, whereas green munitions have the same performance characteristics as standard lead ammunition. Frangible munitions were developed to break apart when hitting hard surfaces, thereby preventing the incidence of ricochets during close-quarter combat. Frangible bullets are not made from a lead projectile covered with a copper jacket but rather are composites of hybrid materials pressed together with adhesives. Although the fragments from the bullets may corrode faster in the environment, potentially becoming more readily available to aquatic organisms than larger-fragment projectiles, the constituents are not as hazardous as lead.

Oak Ridge National Laboratory (ORNL) developed a nontoxic, all-metal replacement for lead in bullets. The frangible bullets are fabricated from mixtures of tungsten-tin. ORNL's Industrial Hygiene Department determined that the metals and alloys in the projectile material for the bullets are environmentally safe (ORNL, 2003). Still, modeling indicates that tin levels in soil could increase near target areas to levels identified by USEPA as screening levels, requiring further analysis and monitoring.

Lead-free "green" bullets have been developed to replace copper-jacketed bullets. The bullets are produced with tungsten-tin or tungsten-nylon cores instead of lead. Depending on the composition, shape, size, and amount of heat treatment, the bullets may be frangible, as described above, or penetrating. Tungsten and tin do not have any known toxic characteristics when used as green bullets (Bogard et al., 1999). Tungsten, a nontoxic metal more dense than lead, and tin, used extensively in food and beverage containers, are now used in the projectile slugs, resulting in ballistic performance equivalent to that of lead slugs but without the environmental impacts. Additionally, tungsten and tin are specified by federal law, Chapter 50 Code of Federal Regulations (50 CFR), 1997, as nontoxic for use in shot for hunting migratory

waterfowl. Also, these metals are not designated by USEPA as hazardous waste constituents and have no applicable federal land disposal restrictions (Bogard et al., 1999).

The environmental stability, mobility, and biological uptake of tungsten from bullets made of tungsten-nylon and tungsten-tin were studied by ORNL. Concentrations of tungsten in leachate from experiments using sand showed the greatest mobility of tungsten. Outdoor exposures and accelerated aging tests studied the stability of materials. Data showed that tungsten powder oxidizes to form tungsten-oxide, which is insoluble in water and fairly stable in the environment. Biological uptake revealed that earthworms were not adversely affected by exposure to soil contaminated with the tungsten-containing bullets; the uptake of tungsten by the earthworms was minimal to zero (Lowden et al., 2003).

Although lead-replacement metals such as tungsten and tin are considered to be less environmentally impactive than lead (Bogard et al., 1999), studies on the chemical fate and transport of all frangible munitions composite materials (i.e., copper, zinc) are lacking. Of concern is the predisposition of frangible munitions to break apart into tiny fragments, which may be readily available to terrestrial and aquatic biota.

Use of frangible and non-lead munitions is recommended to reduce impacts to wildlife. Where possible, deposition of casings and other materials into sensitive species habitats, such as those for the RCW, should be avoided. With Management Requirements in place and the majority of the projectile components removed, minimal exposure of wildlife to metals is expected. However, as a conservative measure, sensitive species habitats should be avoided.

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APPENDIX H

IRP SITE DESCRIPTIONS

IRP SITE DESCRIPTIONS

POI 413, located on TA A-77, was a proposed bridge target for the purpose of testing depleted uranium ammunition. According to a U.S. Army Corps of Engineers (USACE) interview conducted with Mr. Richard Hartman, a former Eglin AFB Radiological Safety Officer (RSO), in January 1995, Mr. Hartman reviewed the request to build the bridge structure and did not approve the request on the basis of the potential environmental impact.

TA A-77 consists of a square-shaped area of approximately 530 acres. This TA contains tactical targets, including vehicle convoys, bivouac areas, and gun emplacements, and is used by Hurlburt Field and Eglin AFB as an active bombing range. There has been no indication that a bridge or pond was ever constructed at TA A-77 and no evidence of DU testing. As there is no body of water present, it is unlikely that the bridge was ever built. No further action (NFA) was recommended for Point of Interest (POI) No. 413 and approved October 1998.

POI 414, located on TA A-79, was a proposed bridge target for the purpose of testing depleted uranium ammunition. Mr. Richard Hartman, a former Eglin AFB Radiological Safety Officer (RSO), reviewed the request to build the bridge structure and, according to a USACE interview conducted with Mr. Hartman (January 1995), did not approve the request on the basis of the potential environmental impact.

TA A-79 contains a fairly high density of unexploded ordnance (UXO) on the ground surface. Johnson Pond, also located on this TA, is used as a tactical air-to-water target area. POI No. 414 was an extension of Johnson Pond, created by a dam and spillway; however, there is no indication that the proposed bridge target was constructed, and according to interviews with Eglin range personnel, there is no evidence of depleted uranium testing or of a bridge (demolished or otherwise) existing on the site. NFA was recommended for POI No. 414 and approved October 1998.

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APPENDIX I

SUPPORTING INFORMATION FOR DEBRIS ANALYSIS

SUPPORTING INFORMATION FOR DEBRIS ANALYSIS

Alternatives 1 and 2

The amount of debris from bombs, small arms/guns, and flares that has the potential to result in debris on the ATGG areas is shown in Table I-1.

Table I-1. Baseline Maximum Amount of Ordnance Debris

Ordnance	A-77	A-78	A-79	B-7
BDU-33 - inert	280	48		
BDU-50-inert		8		
Mk-82			4	
.45 caliber ball	2,770			
.50 caliber	207,320	163,080		
5.56 mm ball	93,820	65,048		
7.62 mm ball	2,076,379	1,697,292		
9 mm ball	49,839	35,133		
20 mm TP	49,286	7,893		
20 mm inert TP	11,307			
20 mm HEI	79,884	62,790		39,387
25 mm HEI	32,261	33,097		53,921
25 mm TP		42,168		
30 mm TP	11,500			
40 mm HEI	162	16		19,345
105 mm	10,651			6,373
105-mm WP inert		1,036		
105 mm HEI		8,216		
12 gauge	3,948			
Rocket 2.75 inert	605	368		
Rocket 2.75 live	302	114		
Rocket 5 inch	2	6		
Flare	144	103		2
Total	**2,630,460**	**2,116,416**	**4**	**119,028**

BDU = Practice Dumb Bomb
HEI = High Explosive Incendiary
Mk = Mark
TP = Target Practice
WP = White Phosphorus

Alternative 3

An increased in 50 percent of training activities may result in the following quantity of ordnance debris (Table I-2).

Table I-2. Alternative 3 Maximum Amount of Ordnance Debris

50 Percent Increase				
Ordnance	**A-77**	**A-78**	**A-79**	**B-7**
BDU-33 - inert	420	72	0	0
BDU-50-inert	0	12	0	0
Mk-82	0	0	6	0
	0	0	0	0
.45 caliber ball	4,155	0	0	0
.50 caliber	310,980	244,620	0	0
5.56 mm ball	140,730	97,572	0	0
7.62 mm ball	3,114,569	2,54,5938	0	0
9 mm ball	74,758.5	52,699.5	0	0
20 mm TP	73,929	11,839.5	0	0
20 mm inert TP	16,960.5	0	0	0
20 mm HEI	119,826	94,185	0	59,080.5
25 mm HEI	48,391.5	49,645.5	0	80,881.5
25 mm TP	0	6,3252	0	0
30 mm TP	17,250	0	0	0
40 mm HEI	243	24	0	29,017.5
105 mm	15,976.5	0	0	9,559.5
105 mm WP inert	0	1,554	0	0
105 mm HEI	0	12,324	0	0
12 gauge	5922	0	0	0
	0	0	0	0
Rocket 2.75 inert	907.5	552	0	0
Rocket 2.75 live	453	171	0	0
Rocket 5 inch	3	9	0	0
	0	0	0	0
Flare	216	154.5	0	3
Total	**3,945,691**	**3,174,624**	**6**	**178,542**

Alternative 4

An increase in 100 percent of training activities would result in the quantities of ordnance debris listed in Table I-3.

Table I-3. Alternative 4 Maximum Amount of Ordnance Debris

100 Percent Increase				
Ordnance	**A-77**	**A-78**	**A-79**	**B-7**
BDU-33 - inert	560	96	0	0
BDU-50-inert	0	16	0	0
Mk-82	0	0	8	0
.45 caliber ball	5,540	0	0	0
.50 caliber	414,640	326,160	0	0
5.56 mm ball	187,640	130,096	0	0
7.62 mm ball	4,152,758	3,394,584	0	0
9 mm ball	99,678	70,266	0	0
20 mm TP	98,572	15,786	0	0
20 mm inert TP	22,614	0	0	0
20 mm HEI	159,768	125,580	0	78,774
25 mm HEI	64,522	66,194	0	107,842
25 mm TP	0	84,336	0	0
30 mm TP	23,000	0	0	0
40 mm HEI	324	32	0	38,690
105 mm	21,302	0	0	12,746
105 mm WP inert	0	2,072	0	0
105 mm HEI	0	16,432	0	0
12 gauge	7,896	0	0	0
Rocket 2.75 Inert	1,210	736	0	0
Rocket 2.75 live	604	228	0	0
Rocket 5 inch	4	12	0	0
Flare	288	206	0	4
Total	**5,260,920**	**4,232,832**	**8**	**238,056**

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APPENDIX J

SUPPORTING INFORMATION FOR AIR QUALITY ANALYSIS

SUPPORTING INFORMATION FOR AIR QUALITY ANALYSIS

Analysis of Ground-Based Emissions

Ground emissions resulting from baseline activities were calculated using emission factors associated with Open Burn/Open Detonations due to the wide variety in munitions used on the subject test areas. Emission factors are multiplied by total net explosive weight to determine pounds of pollutants emitted.

Emission factors were obtained from the *Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations* (O'Brien et al., 1999) and are presented in Table J-1.

Table J-1. Emission Factors for Open Burn/Open Detonation

Explosive By-products	Emission Factor* (lb/lb)
Carbon monoxide (CO)	3.94E-02
Nitrogen oxides (NO_x)	1.78E-02
Sulfur dioxide (SO_2)	1.60E-04
Particulates (PM_{10})	3.00E-01
Volatile Organic Compounds (VOCs)	9.8E-04

* Pounds of explosive by-product per pound of energetic material detonated
Source: O'Brien et al., 1999

For generating tons of emissions from ground-based missions presented in Table J-2 below, the following equation was used:

Emission factor (lb/lb) x Total Net Explosive Weight (lb)/2000 lbs = Tons of Emissions

Eglin Range Utilization Reports from the baseline years were reviewed to compound a list of expended items on the subject test areas. Net explosive weights for these expendables totaled 493,000 lbs.

Table J-2. Baseline Ground-Based Pollutant Emissions (Tons/Yr)

Source	Total Suspended Particulates (PM_{10})	Sulfur Oxides	Nitrogen Oxides	Carbon Monoxide	Volatile Organic Compounds
Emission Factors (lb/lb)	3.00E-01	1.60E-04	1.78E-02	3.94E-02	9.80E-04
Baseline Ground Emissions	73.95	.04	4.39	9.71	.24

The total amount of pollutants generated from ground-based emissions would exceed 88 tons, 84 percent of which would be in the form of particulate matter, including ground dust.

Analysis of Aircraft Emissions

Aircraft emissions were estimated using emissions factors for representative aircraft engines typically involved in subject test area missions. Analysis of aircraft emissions assumed a

scenario of 2.425 sortie hours for Alternatives 1 and 2, while Alternatives 3 and 4 were increased by 50 and 100 percent respectively.

Fuel flow rates and air emission factors for the MH-53J Pave Low helicopter were obtained from the *Air Force Air Emissions Inventory Guidance Document for Mobile Sources* (O'Brien and Wade, 2002) and were based on the T64-GE-100 engine. The MH-53J Pave Low has two engines and an auxiliary power unit. Pounds of emissions per hour for the MH-53 are given in Table J-3. Emissions for the auxiliary power unit, which is used primarily when the aircraft is on the ground, were not considered. For calculation purposes, in Table J-3 military power setting was selected to provide a conservative estimate.

Table J-3. Engine Fuel Flow Rates and Emission Factors for the MH-53

Aircraft Engine	Power Setting	Fuel Flow Rate (lb/hr)	Emission Factors in lbs Pollutant per 1,000 lbs Fuel Burned (lb/1,000 lbs)			
			NO_x	CO	VOC	PM_{10}
T64-GE-100	Idle	284	1.62	75.46	27.97	2.36
	75% Normal	1,217	5.49	4.97	0.20	1.97
	Normal	**1,714**	**7.45**	**1.85**	**0.06**	**1.61**
	Military	1,882	8.01	2.97	0.29	0.92

Source: O'Brien and Wade, 2002

Using the fuel flow rates and emission factors from Table J-3, the total annual helicopter emissions for the subject test areas were derived by the following equation:

$$\text{Total Helo Emissions (lb)} = \frac{\text{Sortie Hours x Normal Fuel Flow Rate x Emission Factor (lb/1000b) x No. of Engines}}{\text{1000 lbs}}$$

Multiplying 2,425 hours (the baseline level of activity) x the military fuel flow rate of 1,882 pounds per hour, then dividing by 1,000 and multiplying by the corresponding emission factor x two engines yields the total annual helicopter emissions presented in Table J-5. For propeller aircraft emissions, the same process is applied but the sortie hours are estimated again at 2,425 hours per year and a military fuel flow rate of 2,456 lbs/hr is used (Table J-4). The AC-130 gunship utilizes four T56-A-15 engines. Table J-5 also presents helicopter and total emissions for presentation of total baseline aircraft emissions.

Table J-4. Engine Fuel Flow Rates and Emission Factors for the AC-130

Aircraft Engine	Power Setting	Fuel Flow rate (lb/hr)	Emission Factors in lbs Pollutant per 1,000 lbs Fuel Burned (lb/1,000 lbs)			
			NO_x	CO	VOC	PM_{10}
T56-A-15	Ground Idle	900	7.49	3.84	1.97	3.64
	Flight Idle	1,240	8.31	2.82	0.58	3.85
	Normal	**2,180**	**9.69**	**1.65**	**0.42**	**1.46**
	Military	2,456	11.42	1.77	0.28	1.22

Source: O'Brien and Wade, 2002

Table J-5. Total Baseline Aircraft Emissions (Tons)

Aircraft	PM_{10}[*]	SO_x	NO_x	CO	VOCs
Total Annual Helo emissions	4.2	5.75	36.56	13.55	1.32
Total Annual AC-130 emissions	14.53	15.01	136.03	21.08	3.34
Total Annual Helo and AC-130 emissions	18.73	15.01	172.59	34.64	4.66

[a]Particulate matter 10 microns or smaller in diameter

References

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APPENDIX K

PUBLIC REVIEW PROCESS

TUESDAY, JULY 13, 2004 Daily News PAGE A7

PUBLIC NOTIFICATION

In compliance with the National Environmental Policy Act, Eglin Air Force Base announces the availability of RCS 03-1235; Air-To-Ground Gunnery: A-77, A-78, A-79 and B-7 Draft Programmatic Environmental Assessment (PEA) and Finding of No Significant Impact (FONSI) for public review and comment. The Proposed Action of the "Air-To-Ground Gunnery; A-77, A-78, A-79 and B-7 Draft Programmatic Environmental Assessment (PEA)" is to allow the 46th TW commander to authorize the levels of activity at the site based upon estimates of increased use. The test areas are primarily used for air-to-ground weapons testing and training and are all located in western Okaloosa or eastern Santa Rosa County The preferred alternative would include authorizing the current baseline of activity and include a number of good management practices as well as a 100% increase in all missions. Your comments on this Draft PEA are requested. Letters or other written or oral comments provided may be published in the Final PEA. As required by law, comments will be addressed in the Final PEA and made available to the public. Any personal information provided will be used only to identify your desire to make a statement during the public comment period or to fulfill requests for copies of the Final PEA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of the Final PEA. However, only the names and respective comments of respondent individuals will be disclosed. Personal home addresses and phone numbers will not be published in the Final PEA. Copies of the Environmental Assessment and Finding of No Significant Impact (FONSI) may be reviewed at the Fort Walton Beach Public Library, 185 SE Miracle Strip Parkway, Fort Walton Beach, and the Navarre Public Library, 8484 James M. Harvell Road, Navarre. Copies will be available for review from Jul. 13th through 27th, 2004 Comments must be received by Jul. 30, 2004

For more information or to comment on these proposed actions, contact: Mr. Mike Spaits, 96th ABW/EM-PAV, 501 De Leon St., Suite 101, Eglin AFB, Florida 32542-5133
or email: mike.spaits@eglin.af.mil. Tel: (850) 882-2878, Fax.: (850) 882-3761

547989

MEMO

29 July 2004

FROM: AAC/EM-PAV

TO: EMSP/46th TW/XPE

SUBJECT: **PUBLIC NOTICE RCS 03-1235, "Programmatic Environmental Assessment (PEA) For the Test Area Air-To-Ground Gunnery: A-77, A-78, A-79 and B-7," Eglin AFB, Florida**

A public notice was published in the *Northwest Florida Daily News* on Jul. 12th, 2004 to disclose completion of the Draft EA, selection of the preferred alternative, and request comments during the 15-day pre-decisional comment period.

The 15-day comment period ended on Jul. 26th, with the comments required to this office not later than Jul. 29th, 2004.

No comments were received during this period.

//SIGNED//
Mike Spaits
Public Information Specialist

Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

August 16, 2004

Ms. Elizabeth B. Vanta, Chief
Environmental Analysis Branch
Department of the Air Force
501 DeLeon Street, Suite 101
Eglin AFB, Florida 32542-5133

RE: Department of the Air Force – Draft Programmatic Environmental Assessment (PEA) – for Air-To-Ground Gunnery: Test Areas A-77, A-78, A-79, and B-7, Eglin Air Force Base – Okaloosa and Santa Rosa Counties, Florida.
SAI # FL200406287320C

Dear Ms. Vanta:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the referenced programmatic environmental assessment (PEA).

The Florida Department of Environmental Protection (DEP) notes that the proposed activities have the potential to impact wetlands and other surface waters. The applicant is advised to avoid and minimize these impacts to the greatest extent practicable. The implementation of Best Management Practices (BMPs) specific to wetlands and other surface waters, in addition to those proposed in the PEA, may be required depending on the level of activity. The Department of the Air Force is advised to contact Amy Porto of the DEP's Northwest District Office at (850) 595-8300 regarding BMP requirements. Surface waters in adjacent areas should be monitored for metals that might be released during gunnery activities. Coordination with the Eglin's Jackson Guard is recommended, especially with the maintenance and assessment of biological resources.

The Florida Department of State (DOS) notes that there are a number of cultural resources recorded within the test areas. Therefore, the Department of the Air Force must consult with the State Historic Preservation Office (SHPO) regarding efforts to identify, evaluate, and provide documentation on significant cultural resources that may be affected by the project. The USAF is advised to contact Scott Edwards, Historic Preservationist, by electronic mail (*sedwards@dos.state.fl.us*) or by telephoning (850) 245-6333 or (800) 847-7278 with any question or concerns.

"More Protection, Less Process"

Printed on recycled paper.

Ms. Elizabeth B. Vanta
August 16, 2004
Page 2

Based on the information contained in the above-referenced project and the comments provided by our reviewing agencies, as summarized above and enclosed, the state has determined that, at this stage, the proposed project is consistent with the Florida Coastal Management Program (FCMP). All subsequent environmental documents prepared for the project must be reviewed to determine the project's continued consistency with the FCMP. The state's consistency concurrence with the project will be based, in part, on the adequate resolution of issues identified during this and subsequent reviews. The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting stage.

Thank you for the opportunity to review this project. If you have any questions regarding this letter, please contact Mr. Daniel Lawson at (850) 245-2174.

Sincerely,

Sally B. Mann

Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/dl
Enclosures

cc: Mollie Palmer, DEP
Dick Fancher, DEP
Scott Edwards, DOS

Florida
Department of Environmental Protection
"More Protection, Less Process"

Categories

DEP Home | OIP Home | Contact DEP | Search | DEP Site Map

Project Information	
Project:	FL200406287320C
Comments Due:	July 28, 2004
Letter Due:	August 23, 2004
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA) FOR AIR-TO-GROUND GUNNERY: TEST AREAS A-77, A-78, A-79, AND B-7, EGLIN AIR FORCE BASE - OKALOOSA AND SANTA ROSA COUNTIES, FLORIDA.
Keywords:	USAF - PEA FOR AIR-TO-GROUND GUNNERY, EGLIN AFB - OKALOOSA/SANTA ROSA CO.
CFDA #:	12.200

Agency Comments:
COMMUNITY AFFAIRS - FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS
Released Without Comment
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
The DEP notes that the proposed activities have the potential to impact wetlands and other surface waters. The applicant is advised to avoid and minimize these impacts to the greatest extent practicable. The implementation of Best Management Practices (BMPs) specific to wetlands and other surface waters, in addition to those proposed in the PEA, may be required depending on the level of activity. The Department of the Air Force is advised to contact Amy Porto of the DEP¿s Northwest District Office at (850) 595-8300 regarding BMP requirements. Surface waters in adjacent areas should be monitored for metals that might be released during gunnery activities. Coordination with the Eglin¿s Jackson Guard is recommended, especially with the maintenance and assessment of biological resources.
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
NO COMMENT BY BRIAN BARNETT ON 07/26/04
STATE - FLORIDA DEPARTMENT OF STATE
DOS has reviewed the Florida Master Site File and our records and note that there are a number of cultural resources recorded within the Test Areas. We look forward to coordinating with the U.S. Air Force in the protection and preservation of significant cultural resources that may be affected by this project.
TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION
Released Without Comment
NORTHWEST FLORIDA WMD - NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
No Comment.
ENVIRONMENTAL POLICY UNIT - OFFICE OF POLICY AND BUDGET, ENVIRONMENTAL POLICY UNIT
No Comment
WEST FLORIDA RPC - WEST FLORIDA REGIONAL PLANNING COUNCIL
No comments-Generally consistent with the WFSRPP.
OKALOOSA - OKALOOSA COUNTY
SANTA ROSA - SANTA ROSA COUNTY

For more information please contact the Clearinghouse Office at:

3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

Visit the Clearinghouse Home Page to query other projects.

FLORIDA DEPARTMENT OF STATE
Glenda E. Hood
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Ms. Lauren Milligan
Director, Florida State Clearinghouse
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 47
Tallahassee, Florida 32399-3000

July 22, 2004

RE: DHR Project File Number: 2004-6143
Received by DHR June 30, 2004
SAI #: 200406287320C
Department of the Air Force - Draft Programmatic Environmental Assessment (PEA)
Air-To-Ground Gunnery: Test Areas A-77, A-78, A-79 and B-7
Eglin Air Force Base, Okaloosa and Santa Rosa Counties

RECEIVED AUG 03 2004

Dear Ms. Milligan:

Our office received and reviewed the above referenced project in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992, and *36 C.F.R., Part 800: Protection of Historic Properties*, Chapter 267, *Florida Statutes*, Florida's Coastal Management Program, and implementing state regulations, for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical, architectural or archaeological value. The State Historic Preservation Officer (SHPO) is to advise and assist state and federal agencies when identifying historic properties, assessing effects upon them, and considering alternatives to avoid or minimize adverse effects.

This office has reviewed the Florida Master Site File and our records and note that there are a number of cultural resources recorded within the Test Areas. We look forward to coordinating with the US Air Force in the protection and preservation of significant cultural resources that may be affected by this project.

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservationist, by electronic mail *sedwards@dos.state.fl.us*, or at 850-245-6333 or 800-847-7278.

Sincerely,

Laura R. Kammerer, Supervisor

for Frederick Gaske, Director, and
Deputy State Historic Preservation Officer

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

☐ Director's Office (850) 245-6300 • FAX: 245-6435
☐ Archaeological Research (850) 245-6444 • FAX: 245-6436
☑ Historic Preservation (850) 245-6333 • FAX: 245-6437
☐ Historical Museums (850) 245-6400 • FAX: 245-6433
☐ Palm Beach Regional Office (561) 279-1475 • FAX: 279-1476
☐ St. Augustine Regional Office (904) 825-5045 • FAX: 825-5044
☐ Tampa Regional Office (813) 272-3843 • FAX: 272-2340

COUNTY: ALL

DATE: 6/24/2004
COMMENTS DUE DATE: 7/28/2004
CLEARANCE DUE DATE: 8/23/2004
SAI#: FL200406287320C

MESSAGE:

STATE AGENCIES	WATER MNGMNT. DISTRICTS	OPB POLICY UNIT	RPCS & LOC GOVS
COMMUNITY AFFAIRS	X NORTHWEST FLORIDA WMD	ENVIRONMENTAL POLICY UNIT	
ENVIRONMENTAL PROTECTION			
FISH and WILDLIFE COMMISSION			
STATE			
TRANSPORTATION			

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

- _ **Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.**
- X **Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.**
- _ **Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.**
- _ **Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.**

Project Description:

DEPARTMENT OF THE AIR FORCE - DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT (PEA) FOR AIR-TO-GROUND GUNNERY: TEST AREAS A-77, A-78, A-79, AND B-7, EGLIN AIR FORCE BASE - OKALOOSA AND SANTA ROSA COUNTIES, FLORIDA.

To: Florida State Clearinghouse

AGENCY CONTACT AND COORDINATOR (SCH)
3900 COMMONWEALTH BOULEVARD MS-47
TALLAHASSEE, FLORIDA 32399-3000
TELEPHONE: (850) 245-2161
FAX: (850) 245-2190

EO. 12372/NEPA

- [x] No Comment
- [ ] Comment Attached
- [ ] Not Applicable

Federal Consistency

- [ ] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

NO COMMENTS

From:

Division/Bureau: NWFWMD
Reviewer: Resource Management Div. Duncan J. Cairns
Date: Date 19 JULY 2004

FROM WFRPC (MON)JUL 19 2004 11:06/ST. 11:06/No. 6806878892 P 1

WFRPC
WEST FLORIDA REGIONAL PLANNING COUNCIL

WEST FLORIDA REGIONAL PLANNING COUNCIL

Post Office Box 9759 • 3435 North 12th Avenue • Pensacola, Florida 32513-9759
Phone (850) 595-8910 • S/C 695-8910 • (800) 226-8914 • Fax (850) 595-8967

Lel Czeck
Executive Director

Cody Taylor
Chairman

Sydney Joel Pate
Vice-Chairman

FAX TRANSMITTAL (S) Total # of Pages (including cover) 1

TO: **STATE CLEARINGHOUSE • FAX:** **(850) 245-2190/(850) 245-2189**
Phone: 850-245-2161

DATE: July 19, 2004

FROM: Terry Joseph, Intergovernmental Review Coordinator
Extension 206
josepht@wfrpc.dst.fl.us

SUBJECT: **State Clearinghouse Review(s) Fax Transmittals:**

SAI #	Project Description	RPC #
FL200407017500C	U.S. Dept. of the Navy is proposing to construct a new Marine Corps Training Center for Company C, 8th Tank Battalion, 4th Marine Division at Eglin Air Force Base, Fort Walton, Florida.	O42-06-30-2004
FL200406287320C	Dept. of the Air Force – Draft Programmatic Environmental Assessment (PEA) for Air-To-Ground Gunnery – Eglin Air Force Base- Okaloosa and Santa Rosa Counties, Florida.	MJ722-06-30-2004

X	No Comments – Generally consistent with the WFSRPP
	Comments Attached

If you have any questions, please call.

"...Serving Escambia, Santa Rosa, Okaloosa, Walton, Bay, Holmes & Washington Counties and their municipalities..."